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Order from chaos

For as long as I can remember, our anniversary issues have always heralded chaos (much more than our regular mad-scientists chaos at any rate). From planning what to do, to actually executing the ideas, it all feels like it's up in the air. Believe me when I tell you that until the last few days before print, the magazine is a mishmash of thoughts, suggestions, ideas, story pegs, and half-finished pieces swirling around in a sort of creative cauldron until a pattern starts to emerge. But then the magic always happens and these ideas start coalescing into what you are holding in your hands right now.

Creative bedlam aside, it is astonishing how small, seemingly insignificant starting points eventually transform into something spectacular. Like the time someone's random idea to try a Pixel Art cover, Robert's love for puzzles, and the prevailing idea for the month's theme being "something about security" resulted in a detail-rich cover and an even more detailed game that got you readers running through the magazine with a magnifying glass. This of course you now know as CTC.

Or the time when at a particular edit meet years ago, we were looking for story pegs for a Green Tech Issue. Someone, I can't quite remember who, was jotting down random words on a whiteboard, waxing eloquent about how a "seed" of an idea is needed. Ironically, I picked up on this and asked whether we could give out "seeds" with the magazine in the hope of sparking a tree-planting campaign. I knew it sounded nuts and I threw the idea out there with much trepidation, but I'm glad I did. We actually ended up giving away seeds with every copy of that month's Digit and hundreds of readers planted them. Pics of those jacaranda trees still make us glow with pride.


Being Digit readers, most of you must've already figured out that I'm hinting at Chaos Theory or what is commonly known as the Butterfly Effect. Mathematically, of course, 'Chaotic Systems' mean something much more specific; but as far as the pop-culture understanding of this theory goes, it can be described as the phenomenon of 'complex and unpredictable results occurring in systems that are sensitive to small changes in their initial conditions'. The famous analogy is that the flapping of a butterfly's wings causes a storm halfway across the world.

If you've been following my column, you know that I'm always interested in patterns, correlation and synchronicity. For my part, I've been keeping an eye out for these flutters within the realm of

technology as well. As fate (or chaos) would have it, an article that linked early RPG games, computer hacking and law enforcement popped up on one of my RSS feeds recently. It turns out, the way in which these disparate domains collided with each other through a series of random events is the reason why the Internet isn't a dystopian wasteland today.

In the late '80s the plot of a soon-to-be-released cyberpunk RPG game provoked the US Secret Services to initiate a raid on the company that was creating the game. So real was the plot apparently, that the CIA actually believed it to be a real conspiracy. In a sweeping crackdown, the company's PCs were summarily confiscated. Unfortunately, much like a raid on your own PCs would unearth some objectionable material, this raid turned up a document that was downloaded (I don't want to say stolen) from an unsecured BellSouth system. The document detailed internal practices of a 911 emergency calling system and became the starting point of a growing wave of hysteria – by any measure, the document wasn't critical; but what was portrayed to the world was that it could easily be used to take down emergency response systems in America. This was the early 90s, so you can imagine how esoteric all this must have seemed at the time. The CIA launched Operation Sundevil, almost a witch-hunt intended to burn hackers at the stake. The hackers, on their part, claimed collectively that their only crime was curiosity.

The ensuing lawsuits that followed changed the way the law perceived hackers – essentially, as people who had a bit more knowledge about computer systems than regular folks did. One of the turning points of the case was when it was revealed that BellSouth had included the same document (detailing internal 911 practices) in a booklet that was already being sold to the public for a few dollars! The witch-hunts ceased and curiosity wasn't treated as a mortal crime.

The trouble with these micro events is that they can only be identified in retrospect. I'd be curious to know if you've identified any of these "flutters". No matter how weak the connect, do send me your conjectures. 



Siddharth Parwatay
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"An unrelated but interconnected chain of events is the reason why the Internet isn't a dystopian wasteland today"

Which issue did we do the pixel art cover for?

[Hint: You have the entire PDF Mega Pack at your disposal]

Answer format:
skoar.in/answer

Poll-U-Shun



Jayesh Shinde
Manager – Test Centre
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"While awareness is a good start, more work needs to be done. The government moves slowly and can only do so much, and the shift to a greener alternative fuel isn't going to happen in a hurry"

Last month I had a severe bout of cough, a constant source of irritation while it lasted. Shortly after the cold ran its course, Siddharth started coughing up a storm for a few days. All this persistent coughing ringing through my ears made me wonder if there was more than just the cold bug to blame for our predicament. What if this was an early effect of the stratospheric levels of pollution in our city?

After digging for some numbers, I found that we Mumbaitees have it better, for what it's worth, compared to our North Indian brethren when it comes to inhaling polluted air. Thanks to a live online air quality index unveiled by the Central Pollution Control Board in April this year (<http://aqi.iitk.ac.in>), it's clearly visible that Delhi (and other major northern Indian cities) needs a pollution intervention fast, because the pollution there is severely out of control. If Mumbai's pollution is bad, then Delhi's and its surrounding area's air quality is downright poisonous.

While awareness is a good start, more work needs to be done. The government moves slowly and can only do so much, and the shift to a greener alternative fuel isn't going to happen in a hurry. As responsible citizens, with the help of technology companies, we need to take the lead on tackling this growing menace, gather data through crowdsourced initiatives, analyse the evidence of pollution in our locality and take some concrete steps towards rescuing the situation. All's not lost yet. Let me point out a few examples here.

Small sensor-based wearable devices like 'Breathe' and others that sit inside ('Nest' and 'Birdi') as well as outside your house ('Air Quality Egg') are already available for consumers to monitor their surrounding air quality and upload the readings on a central website. However, all this is disorganised. After all, how many people will really chip in? The pollution watch effort needs to be incentivised, like it is in the Chinese market. Xiaomi – a brand that's making all sorts of waves in the Indian smartphone market – sells the 'Mi Air Purifier' in China. It conveniently sends pollution readings from in and around your home to mobile phones to alert users of high level of contaminants (if any).

China has an even bigger pollution problem than our country, where besides implementing automobile bans (already in place), much more needs to be done to bring down pollution levels in the air, water and soil. One man's trash is another man's treasure, and it can't be more truer in the case of Chinese enterprises trying to crack the pollution code. Technology titans like Alibaba, Baidu and Xiaomi have all come to treat pollution awareness as a new market to build and sell pollution sensing devices. Alibaba and Baidu released water pollution kits last year, things that can test salt level, pH, oil quality and other harmful waste residue in water, and these things are quite affordable – Alibaba, for instance, sells its kits for about ₹ 650 each.

If Chinese companies can do this, what's stopping Indian companies from entering the pollution watch market? Maybe striving to save the environment doesn't rank as high up as making profits in their 'to-do' list.

But if you thought health hazards can be averted and pollution can be lowered by simply reducing the number of cars on the road, think again. Our indulgence in technology and over dependence on gadgets means a lot of rare minerals, that are hard to procure and difficult to dispose, are harming us in the long run. One way to tackle this is by making it mandatory for technology manufacturers to release a detailed disclaimer on what potentially harmful elements go into the gadgets they make and sell – akin to "no animals were harmed during the making of this movie". Public advocacy groups and citizen watchdogs can remain vigilant on these companies' claims.

Clearly, we aren't making the pollution riddle any easier to solve. But we need to grow up, come of age and do our bit to save the environment, instead of passing the buck. Just like Gandhi urged us to consume Swadeshi goods during the Independence movement, we need to reward the brands and buy products that do their bit to preserve our ecology. ■

Let me know your thoughts on this column at: facebook.com/jayesh.shinde / @jshinde | jayesh.shinde@digit.in

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The Aftermath



Nikhil Pradhan

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"As the weeks rolled by, more news of the devastation in Nepal flowed through"

It's always the minute that follows the news of a natural disaster that's the worst. You try to reach out to your loved ones, fail, attempt to cajole yourself into believing that everything's alright, fail, rinse, repeat. You feel dehydrated, your throat clenches up and you can almost imagine the walls of your esophagus clench hard in an attempt to squeeze out some moisture. You can't think beyond the next few seconds, your thoughts forming a perfect circuit, fears and hopes feeding each other in a grotesque display of symbiosis in the absence of real information.

And then, your call goes through, you hear their voices on the other end and realise they're fine. They're okay, they're all okay, the mantra is on loop in your head.

On the 25th April of this year, an earthquake measuring 7.8 on the Richter scale hit Nepal minutes before the mid-day sun was at its apex. The earthquake was so strong that it was felt in nearby countries like Bhutan, Tibet and Pakistan and in Indian states like Bihar, Uttar Pradesh, West Bengal, Delhi and Sikkim. My parents and my sister live in Sikkim while a large part of my extended family lives in Kathmandu which is the reason why that Saturday morning I was dripping anxiety when the news of the earthquake's lethality floated through social media.

Today, when I look back on that day, I wonder how I would have reacted if I existed within a total feedback vacuum, if I had no ability to access tools like Twitter, Facebook, Google News, Viber and WhatsApp. I'm not someone who panics easily but when I do, I tend to spiral downwards quickly and I realise that if it wasn't for those tools, that Saturday would have been worse, if that's even possible, for me and many others like me.


Let me extrapolate by talking more about that morning. When I felt the earth shake, my first thought wasn't that the situation was serious; after all, I had experienced smaller quakes in Delhi before. I jumped on to Twitter and the magnitude of what had just happened slowly crept over me as tweets popped into view on my feed. When the first BBC tweet that formalised the gravity of the quake appeared, I was already trying to call my folks in Sikkim. Understandably, the network

was jammed, but I did manage to get through and, to my relief, find out that they were fine. Once I was done, I headed to Facebook to browse the timelines of my relatives and friends from Nepal. I could see that a couple of them had posted updates, even though their phones had been unresponsive, which meant that the quake and the resulting tide of concern had pretty much knocked out the country's voice network but the data network was still limping along. Viber and WhatsApp came into play after that. With the help of Viber (and unsuccessful attempts using Facebook Messenger and WhatsApp's calling services), I was slowly able to get in touch with some of my relatives and find out that they were fine.

Facebook and WhatsApp came in handy when one of my aunts in Delhi reached out to me saying that she was unable to get in touch with her family in Kathmandu. Over the span of about an hour, I was able to get news of them and relay the information to my aunt.

By the time evening came, I had successfully managed to talk to, or at least hear from, most of my relatives, thanks to tools that hadn't existed a mere seven years ago. As the weeks rolled by, more news of the devastation in Nepal flowed through, peppered by signs of hope and courage that the world saw on its combined newsfeeds, timelines and inboxes. And somehow it felt like, against all odds, the people in the country where I've spent some of the most joyous moments of my life, would endure and pick themselves up.

So, what would that day have been like if I had been unable to hear from or talk to those in Nepal? I try not to think too long about the answer to that question.

If you want to help those affected by the earthquake in Nepal, head to <http://digit.in/nepal-quake-help> to get a list of charities you can donate to. 

Let me know your thoughts on this column at: @postwar | nikhil@digit.in

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Assisted living

I bet many of you want a smartwatch. What about a VR display? If you can afford it, you probably already have a smart TV, and will soon have a smart fridge, then an AC, a cooker, washing machine, dishwasher and, eventually, a smart home. Obviously, a smart office as well, and a smart car that drives you around, because, well, by then there'll be traffic jams everywhere and we don't want to be frustrated dealing with that now, do we?

You're going to want, nay, need, help with doing just about everything. "It's evolution. The human brain needs to be able to focus on more complex things – do more thinking and waste less time on the mundane," you say.

From the time you wake up till the time you sleep, technology already assists you with everything (or will do so in the very near future). Let's take as simple an aspect of life as waking up on time, for starters.

I wake up thanks to an alarm I set on my phone. Actually, I don't. I always snooze, and even dismiss the alarm, and go right back to sleep. My phone however has four alarms, and is persistent, but only because I set it to be. How much longer before this becomes a truly smart phone and does this for me automatically? Maybe when setting my alarm it will ask me for the urgency, or what it is I want to wake up for. Maybe some day, it will be able to tell the difference between, "Wake me up at 5 a.m. I want to try and get some exercise", and "Wake me up at 5 a.m. I have a flight to catch". Obviously, one of these is way more important than the other, and the persistence levels of the alarm should vary based on that information.

The internet of things will ensure everything is connected eventually, and companies such as Google are already working on frameworks on which such devices could run. By the time you read this column, it should have announced Brillo – its Android-based OS that can run on very low-specced devices (as low as 32 MB of RAM). Obviously, Brillo will talk to your Android phone and allow you access to information about your fridge from anywhere, among other things. Just a litre of milk in the fridge? Up pops a notification on your phone... you get the idea. We've covered the internet of things ourselves several times before – check out our PDF archives in the DVDs.

However, for me, the internet of things and smartphones and touch devices are all still just

stepping stones to the eventual goal: a truly invisible UI.

A voice in your head, perhaps. Cortana and Siri and the likes, but smarter, and just for you. A display that pops up only when you need it, or appears to, but is actually just electrical signals sent to your brain, or eyes. Also, it has to be a personalised experience. My wife's way of using technology is very different from mine, so why should we have the same interface, screens and layout?


Not too many of us in India talk to our phones, because, well, it's daft. Apart from our surroundings being too crowded and noisy, digital assistants make mistakes (although most are getting better at recognising our accents). That aside, the stares you'd get would make you shut up any way.

Now, think about an in-ear phone that your assistant talks to you through (yes, like the movie *Her*), and that you don't need to physically talk back to, but can just move your lips subtly and some wearable camera somewhere will lip read and send that information to your assistant. This isn't science fiction, most of it's being worked on already.

I spent a few months looking at assisted living homes for my dad, and the facilities they offer are scarily similar to the ones technology is beginning to offer us.

He can't take care of himself because of a physical disability, and thus he needs help to move, serve him food, book a cab to travel, buy everyday things such as groceries... basically, he needs human help to be able to function as a normal human.

This is not too different from how I am today. My disability is mental, however, and I can't function without technology to assist me. We will all eventually need it to help us wake, eat, do our daily chores, keep us entertained, appropriately medicated, healthy, prolong our lives, help us sleep...

Is technology just turning us into senior citizens a lot faster? And is that really an evolution in the positive direction? I guess time will tell... 



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"From the time you wake up till the time you sleep, technology already assists you with everything"

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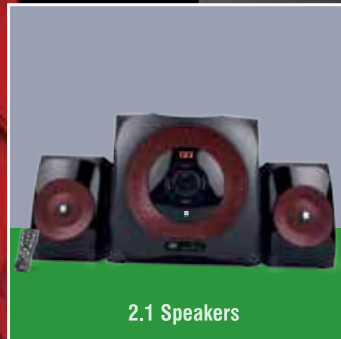
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Disclaimer

For every Digit contest, there will be only one winner, unless specified otherwise.
 In the event of a dispute, the Editor's decision shall be final.

PRODUCTS REVIEWED THIS MONTH

Bazaar

ASUS O!Play Mini
 ASUS PB279Q
 ASUS Sabertooth X99
 Canon Powershot SX710HS
 Google Nexus 6
 Huawei Honor 6 Plus
 Lenovo A6000
 Lenovo Yoga 3 Pro
 Merlin Digital Bluetooth Earphones
 (Running / Jogging)
 Motorola Moto E (2nd Gen 3G)
 Motorola Moto Turbo
 Noctua NH-D9L
 Noctua NH-U9S
 NVIDIA GeForce GTX TitanX
 Xiaomi MiPad
 Xiaomi Redmi 2
 Yurbuds Venture Talk

Comparison Test

Netgear RN104
 Synology DS214Play
 Thecus N2310
 Thecus N4310

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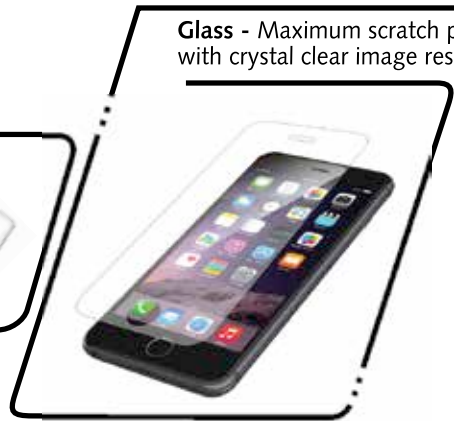
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Invisible Shield Arsenal - Samsung Galaxy S5



ZAGG Arsenal Case - iPhone 5/5S



Speaker Case - iPhone 6



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ZAGG smartbuds



Animatone headphones



iFrogz Tadpole - wireless Bluetooth speaker



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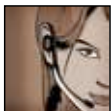
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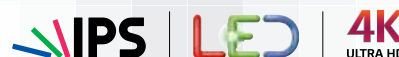
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20

It's back, and it's inside Digit. It's still a work in progress, but send us feedback about it. We're going to try and integrate it seamlessly, so your feedback will be valuable

Snake is back!

The classic hit game, Snake Rewind, has been launched on multiple mobile platforms. More here : <http://digit.in/1QWtjL7>

✉ Hello to a Great Team,

I started reading Digit in the year 2009. Due to my Class 12 board exams and other things, I wasn't able to read any of your magazines after one of your Anniversary issues in which you published about 13 news that you'd like to hear in the future (The man who was saved from cancer by nanobots, but later died of a stroke was my favourite).

Now, after so long, I have plenty of time. So, it's my humble request that if it be your will, please include PDFs of your previous mags like you did earlier.

You once provided a Fast Track on E-Learning. If possible, please tell me how to get that issue. You see, all my previous mags got destroyed in a fire that destroyed my house (The house looked awesome while burning, although it scared the hell out of me as I live alone).

One more thing: In one of your previous issues, you provided some craft work. It was nice, but one request: Next time you provide something like that, provide it on a separate page if possible, because I don't like tearing off the front and back covers of my books.

Truly speaking, the previous issue was quite useful to me. I was searching for stuff that can be cheap and serve my purpose. And that idea of prompts-story writing that you gave in February issue was also good.

This is my first letter, but surely not the last. Unless I get kidnapped by aliens or my Chemistry teacher for not securing good marks in Chemistry.

Keep up the good work, guys!

– Saliq Khan

📧 Nice to have you back with us again Saliq. You're in for a treat - we've not only included previous issues of Digit but also everything else we've ever published. So you have a lot of catching up to do. Here's to hoping you remain abduction-free.

– Siddharth

✉ Hi Team Digit,

This is my second letter to you. I want to share my story with you all, but first here are my thoughts on the May issue.

1. I loved the cover story, and have bought many things mentioned in it.

Feedback for the May 2015 issue of Digit



2. The price of Dragon War Leviathan is incorrect. It's actually ₹900.
3. I didn't quite understand the *dmystify* booklet, although I actually loved the idea.
4. The unsolved problems in science was good. Please include more of these.

Now, coming to the story. I was introduced to Digit at the age of 8, at which time I only bought it for its games during train journeys. As I grew up, I realised the greatness of the content inside the magazine and the Fast Tracks, and soon became a computer geek.

Before reading Digit, I didn't even know that a computer can be assembled by a single person. It helped me build my first computer.

I completely love Digit and don't miss a single issue, so please keep fuelling readers like us.

– Anurag Chittawar

📧 Nice to hear from you again Anurag. Most of us started off the same way too.

– Siddharth

✉ Hi Team!

I'm a big fan of yours and even a regular reader of your mag since a couple of years.

It's my first time writing to you. I just want to say that I loved your article "Reboot Your Career" in the May issue. This helped me considerably improve my

communication skills. That's it for now. Keep up the good work!

– Shagun Dubey

📧 Hey Shagun, nice to know. Here's wishing you a great career to come!

– Mithun

✉ Hey love.

No, love doesn't refer to you guys making this beautiful magazine. It refers to *Ms. Digit*.

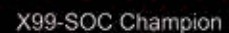
This is my first letter just because I never really felt the need to write one before. I'll come back later to what made me.

Digit, you were love at first sight for me. I can very well recall that moment, but that's a story for another letter. I had a Samsung Corby then and a Nexus 5 now, and I can fully give credit for the transition to you as I wasn't much into tech earlier.

You've changed a lot over the years, but for the better of course and I'm really unable to find anything to criticise you about, but I also won't spoil you with much deserved appreciation (though your makers are doing a fantastic job).

Coming to what motivated me to write in to you, it's your new and amazingly awesome friend, *dmystify*. I know it might hurt you but she's smoking hot and my eyes were transfixed on her while reading because I never really thought that I'd ever be able to understand the theory of

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Letting bugs bite for science

A woman let 200,000 bed bugs bite her to test for a new pheromone. Read more : <http://dgit.in/1PQCva2>



Reduced attention spans?

Microsoft conducted research that seems to indicate that prolonged Internet usage reduces attention spans. <http://dgit.in/1LOWZVN>

LETTER OF THE MONTH

✉ As usual, like many others I too am a reader of your magazine. Before I begin to criticise you, I just want to share a small story about how I came across Digit and purchased it.

I come from a lower middle class family, who doesn't have the luxury of spending a lot of money. I was at this book shop and these two words happen to catch my eye "Tips and Tricks" and they got my motor running. I asked the owner of the shop to hand over the magazine to me and it was the "The Last Issue?". On surfing through the content, I was blown away. It was like a saint giving me a boon and the wait was over. However, when I checked the price of the mag, it said ₹250 and I was stumped. I had no money being financially weak and knew that no one at home would give me this amount.

But I had made up my mind that I would buy it, so I requested the shop-



keeper not to sell the magazine and said that I'd purchase it within a few days. However, he asked for a guarantee. I had around ₹30-33 in my pocket. I gave it to him and said that I'd give him more money the next day and pleaded not to sell it. He somehow took pity on me, looking at my fragile face and agreed. This continued for 10 days. Everyday, I'd give him ₹10-20 and finally got it.

After reading it, I felt like I got my money's worth. Man, the content including the DVDs and FastTracks that you and your team put into it was mind blowing.

Now for some criticism...

Your Appsutra issue was disappointing and I felt as if I spent 200 bucks for nothing but reviews of gadgets and ads. It seems like you guys are running out of topics.

I didn't find the 'Fast Track to Raspberry Pi' helpful either. Only the little magazine about colleges was good. The

game poster was horrifying and scary. Try something new like a superhero theme, Marvel Cinematic Universe theme or fantasy related theme since these things are trending these days. Instead of focussing so much on gadget reviews, I suggest focussing on skill development topics.

The work you guys do is commendable. I know you work hard, but next time make sure your efforts don't go in vain.

Digit has really helped me grow as a tech enthusiast and win the computer prize examinations held in my school thrice. Also, now I'm vice president of my school's computing society.

I could have mailed you but I can't even afford an internet connection. I'm messaging you from my friend's phone.

– Sagar Kapoor

📌 Your story is truly inspiring Sagar. We've sent you something special in the mail (besides a Digit T-Shirt of course). We're sure you'll like them both.

– Robert

relativity. In my defence for choosing her over you, Digit is.. umm.. let's just say I'm only 17 (birthday month!).

But you, Digit are my first love and I'll love you to infinity and beyond. By the way, have you done something to your pages? They feel lovely. *XOXOXOXO*

– Shubham S. Kumar

📌 Oh get a room you two!

– Agent 001

✉ Hello Team Digit,

I'm a gamer and new Digit reader (just 2 months old) from Chandigarh and I'm already a huge fan of yours. First of all, I'd like to say that I really liked your April edition, but that's the past. The present, i.e. the May edition is even more awesome, especially SKOAR! I keep reading the reviews.

Praises:

1. SKOAR!, THE best mini mag I've ever read: Games are my passion and I'm familiar with all the games on Play Store, however, this month's SKOAR!

acquainted me with some games I didn't know about.

2. Blippar: It's the coolest thing I've ever seen. Just one equation:

Weird + Funny = Awesome

3. $E=mc^2$: Yes, truly it's the world's most famous equation, but the history behind is far more interesting.
4. Digit: The article on budget tech was really great and the title is really justified. I have literally no words to express.

Brickbats:

1. Steam games: The screenshots of Survivium in SKOAR! were really good and I wanted to install it, but when I learnt that it was a Steam game, I was disappointed as I had no internet.
2. Bluestacks was also an online installer.

Suggestions:

1. I wouldn't tell you to stop providing Steam games, as Steam is the world's best game provider.
2. If you enabled the cash on delivery option for subscription, then you'd get yourself a new subscriber.

I have a technical issue and it would be great if you could solve it. When I try to install a new app on my Android phone from Play Store (about 24 MB), it gives me an error saying "Insufficient space on your device", in spite of having 5.4 GB of free space on the SD card and 1.23 GB of free space in internal storage. Please help solve this problem. I have cleared my Play Store cache and data and have reinstalled Google Play services by uninstalling the updates. However, this has made no difference.

It would be appreciated if you could review WWE 2K15 PC version in the next issue as I'm looking forward to buying this game.

– Himanshu Kumar

📌 Thanks for all the feedback Himanshu. Detailed letters like this one help us improve by focusing on specific areas. Always nice to know what we're doing well and what we need to improve. As for your Android problem, please send us screenshots.

– Siddharth

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> GREED

For those who just want more than should be humanly allowed, we have enough to satisfy your hunger...

THIS MONTH: AN ANKLE EXOSKELETON, BOLT SKATEBOARD with DYNAMO, SONY CYBERSHOT HX90V, and more...

> TEMPTATION

If you're wondering what to do with yourself or how to spend some time getting cultured, this section is for you...

THIS MONTH: LED ZEPPELIN OVERLEAD, FURIOUS 7, WALK, DIY APPLE II WATCH, UPCOMING MARVEL TV SERIES, and more...

> DESIRE

C.H.I.P.-ing In!

A tiny computer, with a tinier price tag

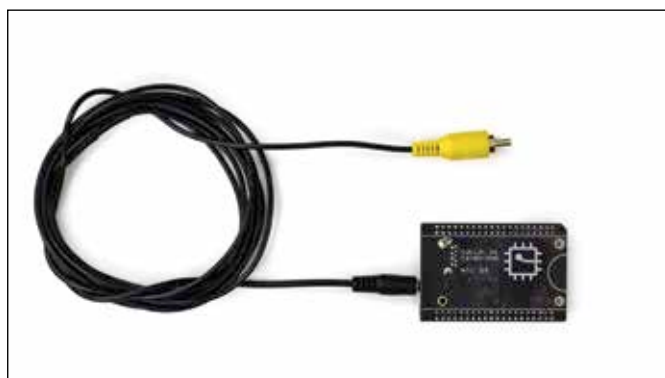


Kiddo swag!

Funskool has buffed up its ops in India by introducing the LeapFrog range of toys. Enter LeapBand, a children's wristband that encourages physical activity through fun tasks. Children can run, jump and play to earn rewards by mimicing a virtual pet that resides in that band. The wristband is rechargeable and is priced at ₹2,749. So, if your child has grown weary of that Hotwheels set you bought last month, you know what to gift him next. Kids are so tech savvy these days.

A few months ago, Raspberry Pi 2 arrived in the market with a price tag of a mere \$35; eyeballs popped. It was cheap, way better than its predecessor and boasted of double the memory and six times the performance. But, now the folks at California based Next Thing Co. have managed to get their counterparts at Raspberry Pi Foundation on their toes, all because of C.H.I.P.!

About the size of three AAA batteries, C.H.I.P., the smallest computer in the world, is priced at a negligible \$9 (much lower than that of the Raspberry Pi 2). The machine runs on a 1GHz processor (The Pi 2's CPU runs at 900MHz) with 512 MB



RAM, 4GB memory and Wi-Fi and Bluetooth capabilities. You can attach a mouse, keyboard, monitor or a TV, whatever floats your boat, C.H.I.P. will just work.

The computer has done wonders on the financial front as well. C.H.I.P. is being crowdfunded on Kickstarter

and overtook its goal of \$50,000, earning more than \$1,653,000 from almost 33,000 backers (so far). An additional \$10 will get you a 3000mAh 3.7V Lithium Polymer battery pack or the VGA adapter whereas adding an HDMI adapter would cost you a total of \$24.

Iron Man S6

Samsung posted a teaser image on its official Facebook account



earlier, of what looks like the box of a special edition Iron

Man-themed Galaxy S6 Edge smartphone. Samsung, however, hasn't guaranteed its arrival in all markets.

Rent your car

U.K. based start-up, Rentcarlo has launched an online peer-to-peer car rental marketplace. The idea is that car owners can earn a few bucks from their car's inactivity whilst providing car renters with more variety and convenient options.

Watch OS 1.0.1

Apple is releasing the first software update for Apple Watch, namely Watch OS 1.0.1. The update is designed to provide general bug fixes. It also adds display support for the new Emoji characters added to both iOS and OS X.

Microsoft Flows to iOS?

Microsoft is reportedly developing an app called Flow, which is set to make its debut on iPhone and will work hand-in-hand with its Outlook app. It's essentially a sort of a "micro-email app", as they call it.



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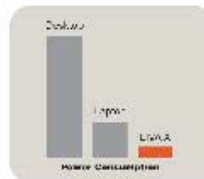
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Dodge Viper ACR

It's everything, and more

Dodge has unveiled its fastest, street-legal Viper track car, the 2016 Dodge Viper ACR. The ACR is designed to exact every fraction of a second that it can. Developed with the help of the lessons learnt from the Viper GTS-R, the makers of this new beast have delved into three aspects: aerodynamics, chassis and tires, delivering enhanced grip.

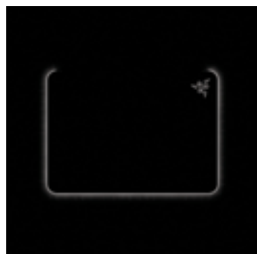


Under the hood, this Sportscar is loaded with an all-aluminium 8.4-litre V-10 OHV (Overhead-Valve engine,) rated at 645hp and 600 lb.-ft. of torque – the most torque of any naturally aspirated sports-car engine in the world. The designers at Dodge have also enriched this piece with Brembo Carbon Ceramic Matrix brakes that are exceptionally resistant to fading and provide excellent stopping power.

Another amazing feature of the ACR has to be the Extreme Aero Package. The model produces a maximum aerodynamic downforce of nearly a ton at a top speed of 285km/h, thanks to this package. It comprises of an adjustable dual-element rear wing, a rear carbon fibre diffuser, a unique SRT hood with removable louvers, a detachable extension for the front splitter and four dive planes.

Razer Sharp

16.8 Million Shades of awesome!



It seems that the designers at Razer have finally tapped into a gamer's true desire. What is this desire? An ambilight mouse pad! And yes, we're being sarcastic. That said, the mouse pad is exceedingly cool and while it's not actually an ambilight device, its got embedded LEDs that can display upto 16.8 million colours. This rounds up

Razer's Chroma collection and is sure to be an imperative part of gamers' desks the world over.

The mouse is for sale only on Razer's store, but as expected, it's priced at an exorbitant ₹3,800.

Google + Skrillex = Edition



Google recently introduced an interesting accessory for Android devices called Edition cases. These cases, which comes in sizes compatible with that of the Nexus 5, Nexus 6, Samsung

Galaxy S5, S6 and Note 4, are complemented with a live wallpaper that displays satellite-captured images of Earth and a customisable button. All this plus a tie-up with Skrillex. An attractive proposition?

SECURITY WATCH

Hangouts conversations can be wiretapped



Google has admitted that Hangouts conversations do not have end-to-end encryption, meaning that the company can tap into those sessions when

it receives a government court order requiring it to do so. "Hangouts doesn't use end-to-end encryption. This makes it technically possible for Google to wiretap conversations at the request of law enforcement agents, even when you turn on the "off the record" feature, which actually only prevents the chat conversations from appearing in your history—it doesn't provide extra encryption or security," explained a Google spokesperson.

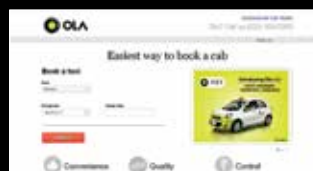
VENOM exposes virtual machines on unpatched host systems



A new vulnerability known as VENOM has been discovered and it could allow an attacker to escape a guest virtual machine (VM) and access the host system along with other

VMs running on this system. The VENOM bug could potentially allow an attacker to steal sensitive data on any of the virtual machines on this system and gain elevated access to the host's local network and its systems. The VENOM bug (CVE-2015-3456) exists in the virtual Floppy Disk Controller for the open-source hypervisor QEMU, which is installed by default in a number of virtualization infrastructures such as Xen hypervisors, the QEMU client, and Kernel-based Virtual Machine (KVM). VENOM does not affect VMware, Microsoft Hyper-V, and Bochs hypervisors.

ISPs asked to block websites of Uber, Ola and TaxiForSure



The Department of Telecom (DoT) has reportedly asked the Internet Service Providers to block websites of Uber, Ola and TaxiForSure in Delhi. The DoT letter, which was

issued to ISPs, invokes Section 69A of the IT Act to block access to the websites of these taxi aggregators. ISPs, however, may write to the telecom department to express their inability to block these websites. The Ministry of Road Transport & Highways (MoRTH) later made provisions in the Motor Vehicles Act to register and operate app-based taxi services within the jurisdiction of states so that competition is allowed to grow. "We do not want to throttle competition. But these services have to operate legally and in accordance with some provisions. In the event of a complete ban, it is the consumer who will suffer," says a government official.



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Say Jeez!

If you thought the HC-V770 was to die for, you might want to reconsider when you look at the WX-970

Panasonic has pulled another rabbit out of the hat and this one is spotless. Say hello to the new HC WX-970, Panasonic's recently launched 4K Ultra HD Camcorder. The 18.91 MP WX-970 comes with advanced twin camera features such as picture-in-picture twin camera recording and is equipped with an additional camera on the side which enables the user to take multiple shots at a time from different points of view. The camcorder weighs 360g, stretches up to 73mm and is Wi-fi enabled.

Panasonic has left no stone unturned when it comes to the performance of this model. For example, the WX-970 features a 4K mode which is designed to capture high-speed HD images and lets you choose a single frame while shooting video. The camcorder is also packed with features to counter unwanted movement - The 'Level Shot Function' detects tilt and corrects footage automatically. Apart from this, the 5-Axis Hybrid O.I.S.+ feature stabilizes your footage by taking care of blur due to zooming and walking. According to Panasonic, the model captures footage in HDR by



blending different exposures to create a balanced video. This is most useful in high contrast environments such as indoors, or in bright sunshine.

The model also supports AVCHD: Dolby Digital (5.1ch/2ch) audio recording system. Lastly, the BSI MOS sensor empowers the WX-970 to provide you with enhanced shots in dim light and helps reduce rolling shutter distortion.

SPECIFICATIONS

Sensor: (1/2.3type) BSI MOS | **Lens Brand:** Leica Dicomar - 4K: 30.8 – 626 mm [16:9] | **Optical Zoom:** 20x | **Standard Illumination:** 1400 lx | **Focus:** Auto/Manual | **Shutter Speed:** 1/50-1/8000 (Motion Image) and 1/2 – 1/2000 (Still Image) | **Price:** ₹84,990

Battle of the S's

It's curved, it's 4K, it's gorgeous!

Sansui entered the major leagues earlier this month when it launched its first curved 4K HD LED TV, months after LG and Samsung launched their versions. This Japanese consumer electronics behemoth took its time but sure has a trump card or two up its sleeve.

The Sansui Curve 4K Ultra HD LED TV gives wider viewing angles due to its curvature and in this way guarantees that the viewer experiences the visual splendor of the display from any angle. A curved, 3D ready display with 4K support is bound to boast of excellent image quality. The latest model by Sansui displays a resolution of 3840x2160 pixels rendering every follicle on the actor's cheek to perfection. The 55-inch model's revolutionary IPS Display that sharpens pixels claims gives a more realistic approach to every image. The Smart TV module, according to Sansui is equipped with Internet scanning, online interactive media, Internet downloading and provides on-demand streaming media at your fingertips. Sansui Connect series is also enriched with an in-built D2H system



with HD transmission which offers TV viewing without an external set top box, giving zero signal loss and maximum audio and video clarity.

The 4 new series is accompanied by the MHL (Mobile High Definition) interface that allows uninterrupted video streaming from Smartphones, tablets and other devices, while simultaneously allowing you to charge your device. Another salient feature you won't find anywhere but in Sansui's catalogue is WHAM (Wireless Headset Audio Mode,) this feature transmits sound signals over FM frequencies and will enable you to use

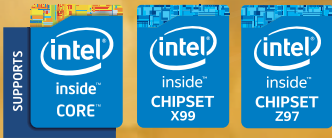
a cell phone or music player as wireless earphones. Comparing the model with LG's Smart, Curved 4K OLED 3D TV, you will have to compromise with the OLED display and the magic remote. But, at a price difference of over ₹2,00,000, it's an easy compromise to make.

SPECIFICATIONS

Resolution: 3840x2160 pixels | **Audio:** Wireless Headset Audio Mode (WHAM) | **Screen:** 55-inch, 4K enabled Curved LED | Enabled with in-built D2H system | **Wi-Fi:** 802.11n | **HDMI Ports:** 2 | **USB ports (2.0):** 3 | **Price:** ₹1,99,000 (Starting range)

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ZTE launches Nubia Z9 Mini

The Smartphone walks on the path of Xiaomi Mi 4i except, it's more loaded.

Chinese device maker ZTE announced the arrival of the much awaited Nubia series of phones with the launch of the Nubia Z9 Mini. This Smartphone is powered by a 64-bit Octa-Core Qualcomm Snapdragon 615 SoC clocked at 1.5 GHz, with 2GB RAM.

The Z9 Mini is not much different in specs when compared to its predecessor, the Z9 Max, except that it has a smaller 5-inch Full HD (1080x1920 pixels) IPS display. It's also bundled with a 16MP rear camera and an 8MP front camera, specially designed for the selfie lover! You also get a 2,900mAh battery, which promises a little over 40 hours of talk time.

The Nubia Z9 Mini and the recently launched Xiaomi Mi 4i don't differ drastically. Although, the front and back cameras do give the former an edge over the latter.

SPECIFICATIONS

Screen size: 5 inches | **Resolution:** 1080x1920 pixels (441 ppi density) | **Memory:** 16GB in-built; 128GB expandable | **Bluetooth:** v4.0, A2DP | **Processor:** Qualcomm Snapdragon 615 SoC

Apple's new baby!

The desk just got more powerful with 67% more pixels. Apple has rolled out a brand new iMac with the stunning 5K display we saw last year. The new 27-inch model costs \$300 (₹19,071) less than the previous version. This version loses the 3.5GHz i5 and gets a 3.3GHz i5 instead. The GPU also takes a hit, moving from an R9 M290X to an R9 M290, the HDD is also downgraded to a normal 1TB HDD.



However, the gorgeous 5K display remains and, despite the drop in price, so does the exorbitant price tag. Still, if you can't survive without a Mac or just want to revel in that glorious display, it might just be worth shelling out the

extra \$300 for the full blown version. What's \$2,200 when you're already spending \$1,900?

SPECIFICATIONS

Processor: 3.3GHz quad-core Intel Core i5 processor (Turbo Boost up to 3.7GHz) | **Memory:** 8GB (two 4GB) of 1600MHz DDR3 memory; four SO-DIMM slots, user accessible | **Storage:** 1TB (7200rpm) hard drive, upgradeable to 3TB | **Display:** 27" Retina display with IPS technology @ 5120x2880
Price: ₹1,59,000

APP WATCH

Phonograph



Phonograph, earlier called Gramophone is a clean music player that has been designed around Google's Material Design Language. This ensures that even the tiniest animations are in line with Material Design, giving the app a beautiful and smooth UI. The app is free and currently in beta. Picking a colour from the album art or cover of the song you're playing, it blends into the UI of the music player, just like the notification bar blends its colour

according to the running app. Phonograph has a very active update cycle, hence great things can be expected from this new music player.

Android: <http://dgit.in/PhonographAnd>

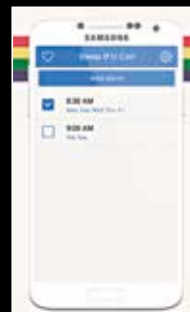
Innbx



Several apps let you connect your favourite social accounts in one single application so that you don't have to use different apps to keep your social life active. Using such clients that integrate your social accounts at one place are great for people and brands that have multiple accounts on the same social platform. Innbx lets you do the same, but the distinct feature here is that it allows you to connect more than one Instagram

account. Multiple accounts are currently not supported by the official Instagram app, so it's quite a pain switching between accounts. The app is in beta and lets you connect only your Instagram accounts for now, the other social accounts will probably coming in on the final release. The app also lets you save the images, so no more screenshots.

Alarmy (Sleep If U Can)



Waking up early in the morning isn't quite pleasant, but not as unpleasant as an alarm. There are thousands of alarm apps out there that you could switch off with just a tap on the screen, not proving strong enough to wake you up. This is boring and also ineffective. Alarmy tries to change that by reworking the traditional alarm mechanism. You register a place in your house by taking a picture of that area and when the alarm ticks off,

you have to take a picture of the same area to turn it off. You also get more options to turn off the alarm by solving a math problem or shaking the phone for a preset number of times.

Android: <http://dgit.in/AlarmyAnd>

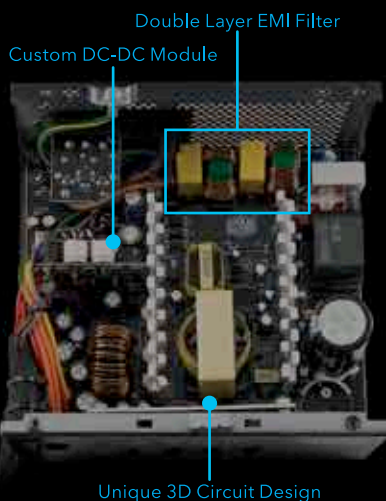
iOS: <http://dgit.in/AlarmyIOS>



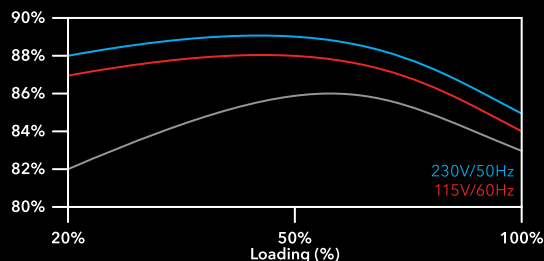
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The Zombie Survival Guide

Everyone and their uncle remembers the godawful train wreck of an adaptation that was the Brad Pitt blockbuster World War Z. Unlike the Hollywood adaptation, Max Brook's original book wasn't just a mindless action shtick featuring zombies. It



was a masterpiece that used a zombie apocalypse as a crucible for examining the geopolitical and human ramifications of the apocalypse.

However, what started it all was Brook's seminal manual on zombie mythos – The Zombie Survival Guide. The book has been written in an uncannily serious manner, and bears a disconcertingly elaborate discourse ranging from the basics of zombie physiology to the careful selection of weapons and fortifications against the undead.

It's easy to pick it up in jest, but it doesn't take long for its meticulously detailed approach to make one doubt if this is indeed a work of fiction. Max Brook's defines suspension of disbelief with a keen eye for detail.

MOVIE

Ex Machina

What makes us human?

AI is an all-time favourite trope not just for science fiction, but even for Hollywood. The prospect of a machine becoming self-aware and sentient has always fascinated mankind. Ex Machina explores the same theme but does it with a lot of finesse. Tense, deep, philosophical and full of thought-provoking dialogue, Ex Machina sucks you in from the word go.

A young intrepid coder at Google, sorry BlueBook, wins a chance to spend a week with the company's eccentric founder at his remote sprawling estate in the middle of nowhere. This little win of course isn't as innocuous as it seems. Caleb, the talented young coder, has been brought in under this pretext of a competition by Nathan for the specific purpose of testing an AI prototype he's been working on. Caleb is to give his own assessment of whether the AI can pass the Turing Test.

The AI as it turns out is not a black box, but a deliciously realistic android named Ava. The sessions between Ava and Caleb are clinically observed over by Nathan via the building's CCTV system. It starts getting dark when suspicious power outages start occurring



during these sessions and Ava reveals some startling things about her creator Nathan.

Without telling you too much we can tell you that eventually Caleb realises he isn't a mere administrator of an experiment. Questions about what it means to be alive and the extents to which a being will fight for survival are brought up by the film. What we like is the realism, especially the kind of things that are truly plausible when you have the world's search data at

your fingertips. The performances by all four primary characters – Nathan, Ava, Caleb and Kyoko (a sort of full service Asian house keeper) – are brilliant.

Some might find the dialogue-heavy style a bit cumbersome to follow, but the movie is worth the effort. The end leaves you with a lot of questions unanswered and will make you question your own reality. A must watch Sci-Fi thriller for sure.

- Siddharth Parwatay



Supergirl

The 6-minute long trailer for Supergirl clearly depicted what a chick flick for superheroes would look like. Just like her cousin, no one recognises Supergirl with her glasses on.



Minority Report

Some sci-fi movies are worthy enough to be remembered, Minority Report falling among them. But the first look of the new TV series might just have revealed too much, leaving us unimpressed.



Limitless

Yet another movie is being rebooted as a TV series – probably the easy way out nowadays. Limitless was great indeed, and all of us actually looked for NZT-48 on the Internet. Oh, and Bradley Cooper will continue his character.

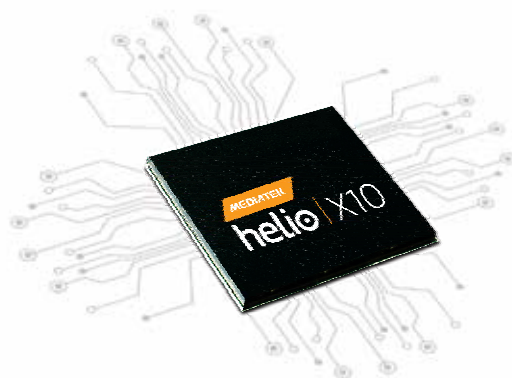
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Computing

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 - DC-HSPA+ R8 (42Mbps/11Mbps)/TD-SCDMA Rel.7 (2.8/2.2 Mbps)
- ▶ Support Wi-Fi 11ac/BT/FM/GPS/Glonass/Beidou/ANT+



The nuviCam LMTHD

A stand-alone GPS unit that's swimming against the tide in an era of Smartphones with GPS. Equipped with a 6-inch screen (800x480 pixels) bright enough to be visible even in direct sunlight, the device comes at \$400.



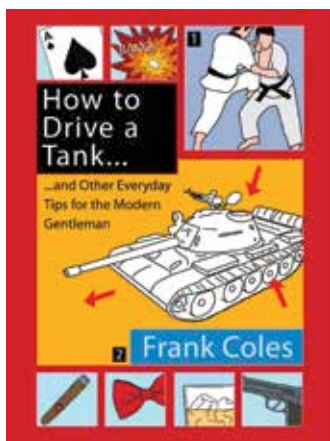
Anker

Is here to answer the calls for a faster charging speed for your MacBook, by rolling out the line of USB-C range of portable batteries. The arrival of these cables will undoubtedly ease the issue related to Apple's futuristic single-port notebook design.

BOOK REVIEW

How to Drive a Tank...

and Other Everyday Tips for the Modern Gentleman



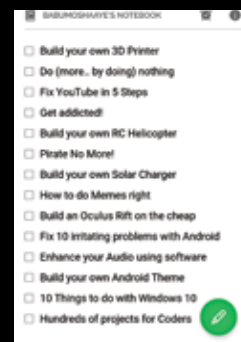
How to Drive a Tank is the sort of book that polarises opinions. Its target demographic constitutes the sort of red-blooded survivalists who tend to buy a book and then build a shelf to house it. Although it isn't directed at colour-coordinating metro-sexuals, the book endeavours to make men out of them by delivering just what's advertised on the cover – an outrageous laundry list of tasks that range from being a great dad

and surviving in the wilderness to winning gunfights and getting rid of dead bodies. The book covers an amusing blend of sensible and downright insane virtues that are supposed to define a modern gentleman. And, yes, that includes a detailed guide on driving tanks, as advertised on the cover. The author himself comes as close to a modern-day version of Hemingway as is possible in these peaceful times. From hotwiring cars and picking locks to winning fistfights and wooing women – Coles taps into his adventures spanning the Middle East, SE Asia, Europe, and taking him as far as the North Pole for material. Although Coles goes into fair detail while covering the interesting smorgasbord of tasks, it goes without saying that the book can't be considered a manual for the same. It's still an entertaining read and a great source of inspiration for men to cultivate the spirit of self-reliance.

Nachiket Mhatre

Too many things to do!

The special double DO issue this month, bombards you with a lot of stuff that you can actually do this summer. There are so many things we've covered in this issue that you'll definitely need a way to plan and organise your schedule. Check out the following to-do and check-list making apps to keep up.



Evernote

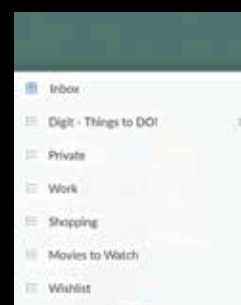
A neat little app that offers a bunch of features, Evernote is a complete package one can offer in note making and to-do lists. Present across almost every platform out there, creating notes and checklists are made really easy in their intuitive and smooth UI.



Any.do

If beautiful animations and gestures are your thing in mobile applications, Any.do has the best one among the other apps mentioned here. The app falls short from the rest since you can't create a public list that can be shared with anyone,

but if you have everyone using only the mobile application, you are good to go.



Wunderlist

Another good looking to-do list making app, an advantage offered in Wunderlist is that each task under a folder can be assigned to someone along with deadlines and reminders. It contains the remaining bells

and whistles of regular to-do apps, inside a customisable UI.

For good karma, we have created a public Evernote check-list of all the Do stories. Save it to your Evernote and directly jump into DOing. <http://dgit.in/DigitDO>

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Computers save us from epidemics

Scientists are able to use computers and predict whether animals might harbour dangerous epidemic-causing microorganisms. <http://digit.in/1IQP4vs>

Beer for ladies only

A gender-detecting beer billboard in Hamburg lit up only when ladies pass by it: <http://digit.in/1Hv7W1k>

Multiple component organ failure? Stuck while overclocking a GPU? And more..

If you're someone who's having trouble getting a hold of what synthetic memory benchmark results mean when it comes to real world memory performance, or you're just frustrated after witnessing the death of precious PC components one after another, fret not! Team Digit is here to save the day for you.

Q Is it alive?

I was a regular desktop user from a long time but that changed when I bought a laptop around more than a year ago. I started using the laptop extensively because I was never at the same place for more than a few weeks and hence my desktop was left neglected all this while.

Recently when I powered on my desktop after close to 15-16 months, I noticed that it was running super slow. This was unusual because the last time I used it, it was working absolutely fine. In order to rectify this, I opened the desktop, disconnected and reconnected most of the cables, re-seated the RAM and graphics card. I also replaced the HDD that the PC had with an SSD but to no avail. The system still ran extremely slow. Reinstalling Windows was an ordeal in itself as it took me more than a day to get it done

because of the slow speed. I even updated most of the drivers which took a similarly long time.

The PC also failed to install motherboard drivers as the setups couldn't run for some unknown reason and kept auto-closing. I can't seem to wrap my head around what's wrong with the PC.

Any pointers on what I should do would be really appreciated.

—Omkar Shete

A Frequently changing addresses and moving with a desktop while also not using it for a long time have always been known to cause their own set of troubles as we see in your case.

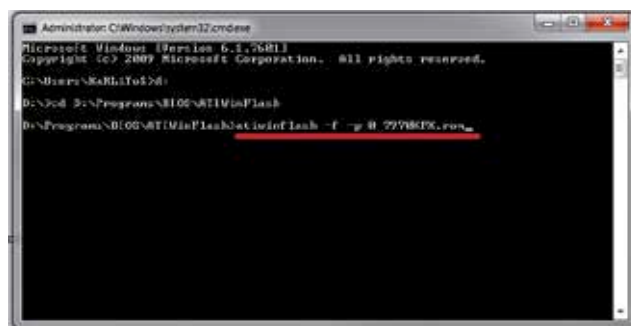
Since you've already tried disconnecting and reconnecting stuff inside, we would suggest you to compartmentalise your approach towards figuring out what's wrong. Start by going from one component to another component like checking out whether the PC will POST with only one stick of RAM installed along with the CPU on the board but without anything else like storage drives or other drives.

If everything goes smoothly, install the graphics card next and check again. Do this in a step-wise manner for each component as you finish testing one and move on to the other like the HDD next, for example. This process will most likely help you find out the component(s) that is(are) at fault.

It would also help if you can somehow test each of your components individually on another PC as this would let you perfectly identify faulty hardware and set it aside. If all the components are working as they should be, the desktop's motherboard is most likely the one with issues. Get a hold of another compatible motherboard for your components and try running the desktop with it. If it works, buy a new board and you'll be set.

Q GPU OC After effects

Okay so, I had an old ATI Radeon HD5450 (XFX One/1GB DDR3) which previously



Use the correct flags to ensure a proper recovery

belonged to my brother. I wanted get some extra performance out of it but couldn't set the memory clock any higher than 600 MHz due to locked voltage controls, which is frustrating because usually 5450s are clocked at 800 MHz by default.

So, after struggling a lot with Afterburner and Trixx, I decided to flash its BIOS because in that form it was of no use to me. The flashing process was successful. I used a BIOS clocked at 800 MHz. But after I rebooted the PC, the display went all crazy with random letters,



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SD CARD



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Cars as app platforms?

Fitbit for your car, developed by Automatic is designed to convert your car into an app platform.
<http://dgit.in/1FrejTQ>



Did you know?

At over 2000 kms long, the Great Barrier Reef is the largest living structure on Earth!
<http://dgit.in/1IGIpVX>

numbers, lines and what not scattered all across the screen. I do have the original BIOS backup but I can't reflash it if I can't even enter my system BIOS, but the PC works fine when I remove the card and use the IGP. I hope there's a way to fix it and you guys can help me out, soon. Thanking you in advance.

—Ayush Bagchi

A Hey Ayush,
 Let's hope that the overclock hasn't caused any irreparable damage to the video card's memory chips.

Try this approach:

1. Set the primary display adapter to the onboard chipset in the motherboard BIOS before plugging in your card.
2. Stick the HD5450 in and check if the computer boots up. If it does not, swap the graphics card to another PCI-E port and try again.
3. Open up a command prompt and list out all the adapters visible to ATIWinFlash (Use instructions available at <http://dgit.in/ATIWinF> and <http://dgit.in/ATIWinF2>)
4. Use the -pcie flag to do that.
5. Assuming you are able to see the adapter listed at a particular index, simply flash the old firmware onto the card at that index.
6. If you want, you can check if you still have write access to the graphics card's ROM using the -t flag.
7. If there are any mismatches then you can force the ROM flash process using the -f flag.
8. Let us know if it works out.

RAM Issues

Hi Team Digit,
 I use an AMD based system with the following configuration:

- Processor: AMD FX-8350;
- Motherboard: MSI 970A-G43;
- RAM: G.Skill Ripjaws X 8GB (4 GBx2) 2133 MHz F3-17000CL11D-8GBXL;
- Storage: Samsung 840 500 GB SSD;
- GPU: Radeon HD 7770;
- OS: Windows 8

Previously I was using a 1333 MHz 8GB memory kit from Kingston on this PC and recently upgraded to the G.Skill RipjawsX kit mentioned above. I upgraded to this kit



SiSoft Sandra (Free Version) is a great PC benchmarking utility

because the frequency of this RAM is the maximum a MSI 970A-G43 motherboard can support.

Since I didn't know about any performance report finding software, I downloaded something called "PC Benchmark" from the Windows Store in order to check the performance of my PC after the RAM upgrade. However, what I found was that the score that I got using this software was lower as compared to the score I got with my old memory kit - a drop from 1,382.4 to 1,197.57.

I know that the task manager reports exactly half the frequency of the actual frequency and so I'm observing 1067 MHz which seems alright. I even saw a slight improvement in performance as some programs seemed to load faster than before. But what is the deal with this RAM

kit when it comes to the performance benchmark using that program?

Can you tell me whether something's wrong with this memory kit or not?

—Aneesh Prajapati

A Hi Aneesh,
 Memory bandwidth is known to give results that may look fishy or different in synthetic benchmarks making you fuss over its performance. Different memory benchmarks give results differently and it's always advisable to use popular benchmarking tools that are known to all so that you can refer to results from others with similar hardware and compare scores accordingly.

SiSoft Sandra (free version) is a really good all-rounder benchmarking suite. Or, you can even use MaxxMEM² available here: <http://goo.gl/EDg2Wn>, which is also a nifty little memory benchmarking utility. Giving you an example about memory performance, Intel's new Haswell CPUs actually make quite some use of higher memory bandwidth which may be slightly visible in real world use and result in better performance.


In order to gain some peace of mind over this RAM issue, slot in your old Kingston memory modules and run SiSoft Sandra which has a variety of tests including synthetic memory benchmarks that will tell you accurate scores.

Compare results with both the kits and you'll see the difference. But, honestly, will the synthetic scores matter that much when it comes to translating that performance into real world applications?

This is somewhat difficult to say outside synthetic benchmarks and encoding. Although we have seen an improvement in performance when using higher frequency memory but this improvement was always in synthetic benchmarks and visible to a small degree in real world applications but it wasn't enough to justify paying a huge sum of money for faster RAM modules.

But with the changing CPU landscape, we'll see improvements steadily, as witnessed while using Haswell. As for your memory modules, they seem to be working absolutely fine and you can stop stressing over them now. **!**





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Microwaves caused scientific panic

Scientists recently found out that unknown radio signals detected 17 years ago were from the staff microwave. Read more: <http://dgit.in/1L15znA>



Smartwatches and beyond!

Digit had a chance to catch up with S.T. Liew, President, Smartphone and Wearable Devices Business Group, Acer Inc at the company's Global Press Conference held in New York City last month.

◀ S.T. Liew, President, Smartphone and Wearable Devices Business Group, Acer Inc.

Siddharth Parwatay
siddharth.parwatay@digit.in

Q How useful do you think smart watches are? Is it a category where the use-case is only validated once you buy the product?

Liew: I feel that smart watches are used currently for a very targeted purpose. Also, smart watches come in two categories: one is the smart band and the other is smart wear like Apple and Android wear. I think that the market over the last two years has seen greater performance in the band area rather than in the wear area. There are technical as well as use reasons for this trend.

On the band area, I see continuous growth and that is because the use case for the bands is already established. People know about the experience it provides – activity tracking, calorie monitoring and so on – and hence this is sold. But, how do we grow and expand the user experience in the band area is the challenge and that is where we come in.

We are entering the market later than the FitBits and JawBones of the world and we recognize that. This is why we don't only target the user experience on those type of offering only. We have a longer view of the world. The band that we have come up with is focusing on the sports and activity area of course, but

the other thing we are focusing on is health and how to tie it all into our cloud and BYOC and IT services. From that perspective there is already a captured audience that will use the band. But on the smart wear area people still need to be convinced that it's something worth doing. Apple watch seems to be successful – at least they report it to be – but we will see.

Q Isn't battery life a big impediment?


Liew: Yes it is and that is why I have a hesitation on the wear side. On the band side this thing lasts for 5-7 days so it's okay. That's why when we define our band we are very careful about what features to include and exclude. And, also if you look at the display on our band there is no colour, it is black and white and very low light. The whole reason for this is to conserve the battery and do the key things. We carry this philosophy even with our sensors.

For example, there are two sensors we are adding to our band this year. One is a heart rate sensor where we are using optical heart rate so that it consumes very little energy because of the LED. The other one is what we call 'Galvanic Skin Detections'. The sensor itself has two gold-plated contacts touching your skin and it is very passive in current drain so

that it will maintain the battery life to what we want it to be. In heavy usage it is about four days and in normal usage it is about seven days so we feel that is more acceptable. But, to your point on the battery life on the wear side – it continues to remain a challenge, yes.

Q Stress tracking – what does it do and what is its use case?

Liew: Our wearable strategy focuses on three important pillars – fashion, life-style and health.

The stress tracking helps you manage your health. It doesn't solve you being stressful but it will help you manage your health, as it will provide you data throughout the day. For instance, the report I showed you will collect your heart rate throughout the day. It's power consumption is so low, it can actually do that. Every day it will take 150 scans of your heart rate and then take another 150 scans of your skin, perspirations and all that – that's what galvanic skin response is all about. And, through a fusion of these sensors and your activities we can tell you how stressful you are, relatively throughout the day. You can then do your review after a week to analyse what was you were doing on a particular day to be so stressful and then see how you can take corrective steps. 

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You Know What?

If one could fold a paper 50 times, its thickness would exceed the distance between Earth and the Moon: <http://dgit.in/1EdLZiF>



Appliances get smart

The age of smart appliances is ushering in, and it seems to be on a collision course with the Internet of things. To talk all about it, we caught up with Mr. Kamal Nandi, the Business Head & Executive Vice President of Godrej, Appliances, at the launch of a brand new smart refrigerator series in India to understand the trends and technologies that are in the offing for tech-savvy customers.

◀ Kamal Nandi, the Business Head & Executive Vice President of Godrej Appliances

Jayesh Shinde
jayesh.shinde@digit.in

Q Could you please explain the need for smart appliances, especially in India? Is this a mere marketing gimmick or is there really a demand among consumers to have smart appliances in their kitchen?

K.N: I think what we're trying to really promote is real social networking. See, food is a core component of social interactions. It becomes very central to any interaction or party that we have. But how a product can enable one to achieve this interaction is the goal we are trying to address. The latest product we've launched, the NXW, which stands for NeXt World, is an example of the next 'world' that will happen after all the social networks and real-life interactions that we are living today. The next world is where real social networks occur, where people will once again get back to earlier days like meeting together, interacting face to face. This product supports that idea. Hypothetically, if your friends are over at home and you want a crate of beer chilled super fast, you can ideally convert the entire top half of your fridge into a chiller. Similarly, if one has to store cakes or pastries along with their food, a section of the fridge can be converted for the purpose. Suppose you don't want to go to the vegetable market

every day and store more groceries in your fridge itself? The product lets you convert the fridge into a 'provision storage' unit. So, it has that flexibility. There are 36 possible combinations within the 'provisions' compartment. Each compartment has a number of shelves and each shelf can be programmed to a different temperature setting. That is the kind of flexibility available to the consumer, along with an excellent user interface both on the inside and outside of the product. This is by far the best technology, not only in India, but in the world with regards to this kind of flexibility.

Q Sounds very exciting. My next question is, there's a lot of jargon terms that I read in the press release that was sent out, like 'Just Right Temperature', 'Motion Sensing Zone Light', 'Stay Cool' and 'Smart Lock technology' in Godrej refrigerators. Could you explain these in brief?

K.N: Let me first talk about Just Right Temperature. We've given this technology a simple Indian name. We're not making it complicated for consumers. If you want to set the product at 'Chiller', set it at 'Chiller'. If you want to set it at 'pantry', set it. So what happens is the fridge will give you the exact temperature required for chilling, or pantry, or provisions. This is 'Just Right' technology.

As an energy-conscious brand, we have been producing products which consume the least energy. With this product, we wanted to carry on the idea. So, what the product has is a very dim light for the entire fridge. If you access a particular compartment, that compartment lights up. It dims down as you take out your hand again. That is what our Motion Sensing Zone Light is about.

Q Just to speak about energy efficient, eco-friendly products, apart from the product being CFC, HFC and HCFC free, what are some the additional measures used?

K.N: First of all, all our appliances use 'green gas'. This gas has about 3% potential to contribute to global warming and nearly 0% potential to cause ozone depletion. It is a natural gas called isobutane. That is something we are extremely proud of, which we've been doing in all our refrigerators for the last 12 years. We have churned out more than 20 million products with isobutane, and have reduced more than 20 million tons of Carbon Dioxide emissions. That is the type of benefit it brings to nature. At the same time since we're using such a low pressure natural gas, it is highly energy efficient. In terms of energy efficiency, this product will rank higher than any other product in the market. **Q**

CURVACEOUS BLUE PRISM

HAVING A POWERFUL MACHINE DOESN'T MEAN YOU SHOULD COMPROMISE ON DESIGN.

We are into advance world where everything is operated by Internet, every small thing needs a wireless connectivity let it be your Laptop, Smartphone or that small device you connect with Internet. We are bound to live in this Wireless world of today. If you agree to above point, Router is a first thing which tickles our brain cells when we think of Wireless world, let's say Wi-Fi is something which we primarily expect from a Router and there are very few companies who have mastered themselves in providing customer with an Reliable choice for their home or offices. Below is detail of one such solution provided to you by TP-LINK, Archer C20 (an affordable blue prism).

WHAT IS ARCHER C20?

TP-LINK's Archer C20 comes with the next generation Wi-Fi standard – 802.11ac, backward compatible with 802.11n and 3 times faster than wireless N speeds. With higher power efficiency and robust security, 802.11ac is the perfect way to accelerate a home multimedia network and solve congestion that multiple devices may cause.

733MBPS DUAL BAND CONNECTIONS FOR LAG-FREE WORK AND ENTERTAINMENT

With 433Mbps wireless speeds over the crystal clear 5GHz band and 300Mbps over the 2.4GHz band, Archer C20 offers you the flexibility of two dedicated networks and ensures amazing wireless performance. Simple tasks such as sending e-mails or web browsing can be handled by the 2.4GHz band while bandwidth intensive tasks like online gaming or HD video streaming can be processed by the 5GHz band – all at the same time.



STABLE OMNIDIRECTIONAL SIGNAL AND SUPERIOR COVERAGE

With 2 fixed external antennas combined with higher quality antenna technology, you can experience excellent wireless performance with stable signal in every direction and high speed across greater distances. This provides you with incredible wireless coverage and reliability from anywhere in your large home or office.

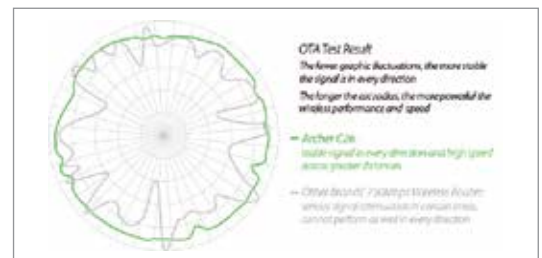


ABOUT TP-LINK

TP-LINK is a global provider of SOHO & SMB networking products and the World's No.1 provider of WLAN products, with products available in over 120 countries to tens of millions customers. Committed to intensive R&D, efficient production and strict quality management, TP-LINK continues to provide award-winning networking products in Wireless, ADSL, Routers, Switches, IP Cameras, Power line Adapters, Print Servers, Media Converters and Network Adapters for Global end-users.

For review units and queries on availability in your region, please contact gaurav.rawool@tp-link.com with your credentials.

You can find more details on <http://www.tp-link.in/>



EASY USB STORAGE AND SHARING

You will be inquisitive what if I want to share my storage wirelessly to all my connected devices, you know for that moment when you want your data easily accessible to all your office staff or home for instance, or when you want to give that print wirelessly, Well.... apart from all amazing offering this router also provides you with 1 USB 2.0 Port for storage and sharing. This will act as your print server, media server, FTP Server or storage sharing.



WHAT'S MORE? YOU ASK.

- Guest Network – Guest Network access provides secure access to guest sharing your Wi-Fi Network
- Parental Control – Parental Controls allow parents or administrators to deploy restricted access for children or staff. With URL blocking, you can easily set up a black or white list to limit the level of web access.
- IPV6 Support – The Next generation on Internet protocol, future-proofing the network you are setting up today.
- Easy Setup – Quick and hassle free installation via the web configuration utility from any laptop, smartphone or tablet.
- Signal Rate – 5GHz: Up to 433Mbps
2.4GHz: Up to 300Mbps
- Antenna – 2 Detachable Dual Band Antennas
- Dual USB Ports – 1 USB 3.0 Port + 1 USB 2.0 Port
- Easy One touch WPA – wireless security encryption with the WPS button ■

digit RECOMMENDED BUYS

From smartphones to graphics cards, here's what we recommend for your next purchase!



TOP 3 BUDGET SMARTPHONES

Brand	Model	Price (in ₹)
Micromax	Yu Yuphoria	6,999
Xiaomi	Mi 4i	12,999
Asus	Zenfone 2	14,999



TOP 3 SMARTPHONES

Brand	Model	Price (in ₹)
Samsung	Galaxy S6	55,900
Motorola	Moto Turbo	41,999
Apple	iPhone 6	62,500



TOP 3 GAMING LAPTOPS

Brand	Model	Price (in ₹)
Lenovo	Y50-70	86,990
ASUS	G551JK-DM053H	81,990
MSI	GT72 2QD Dominator	1,79,900



TOP 3 ULTRABOOKS

Brand	Model	Price (in ₹)
Acer	Aspire S7-392	1,15,565
Apple	MacBook Air (13.3 inch 256GB)	79,494
Lenovo	X1 Carbon 208A	1,74,000



TOP 3 GAMING CABINETS

Brand	Model	Price (in ₹)
Cooler Master	HAF Stacker 935	14,137
Corsair	Obsidian 900D	24,292
Cooler Master	COSMOS II	26,000



TOP 3 GRAPHICS CARDS

Brand	Model	Price (in ₹)
XFX	Radeon R9 295X2	90,999
ZOTAC	GTX 980 AMP! Extreme Edition	50,744
NVIDIA	GTX Titan X	85,099



TOP 3 BUDGET TABLETS

Brand	Model	Price (in ₹)
Lenovo	A8-50 (16 GB Cellular)	16,850
Apple	iPad Mini (Wi-Fi)	16,700
Xiaomi	Mi Pad	12,999



TOP 3 TABLETS

Brand	Model	Price (in ₹)
Lenovo	Yoga 2 (32 GB Cellular)	48,290
Samsung	Galaxy Note 10.1 (32 GB Cellular)	47,369
Apple	iPad Air 2 (32 GB Cellular)	42,900



TOP 3 GAMING MICE

Brand	Model	Price (in ₹)
Razer	DeathAdder 2013	3,590
Roccat	Kone Pure Color	5,100
Steelseries	Sensei	6,263



TOP 3 GAMING KEYBOARDS

Brand	Model	Price (in ₹)
Steelseries	6Gv2	6,799
Razer	BlackWidow 2014	8,499
Cooler Master	Quick Fire Rapid	10,360



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BASIC RIG

Processor	Intel Pentium G3240	3,390
Motherboard	Gigabyte GA-H81M-S1	3,638
RAM	Kingston ValueRAM 2 GB 1600MHz	1,057
HDD	Toshiba 500 GB DT01ACA050	2,950
Graphics Card	None	0
PSU	Corsair VS450	2,190
Speakers (2.1)	Creative SBS A120	1,219
Optical Drive	Samsung SH-224DB/IDDS	925
Mouse	Logitech MK200 (Bundle)	714
Keyboard	Logitech MK200 (Bundle)	0
Sound Card	None	0
Sub-total	(Excluding Monitor and Cabinet)	16,083
Monitor	Dell E2014H 19.5-inch LED	5,471
Cabinet	Antec ASK-4000B-U3	2,305
Total		₹23,859

ENTRY-LEVEL GAMING

Processor	AMD FX8320	9,690
Motherboard	Gigabyte GA-970A-DS3P	5,890
RAM	ADATA Premier DDR3 4 GB (2 x 2 GB) PC RAM (AD3U1333B2G9-R)	2,799
HDD	Seagate Barracuda 1 TB	3,370
Graphics Card	SAPPHIRE R7 265 2 GB	10,990
PSU	Cooler Master Thunder 450W	2,790
Speakers	F&D F680	2,647
Optical Drive	Samsung SH-224DB/IDDS	925
Mouse	Logitech MK200 (Bundle)	714
Keyboard	Logitech MK200 (Bundle)	0
Sound Card	None	0
Sub-total	(Excluding Monitor and Cabinet)	39,815
Monitor	Dell S2240L	8,276
Cabinet	Antec X1-T Gaming	2,750
Total		₹50,841

ULTRA HIGH-END GAMING

Processor	Intel Core i7-4790K	22,590
Motherboard	ASRock Z97 Extreme6	15,899
RAM	Kingston HyperX Predator 2x 8 GB KHX21C11T2K2/8X	16,298
HDD	WD WD30EZR 3 TB + Samsung 850 Pro 256GB SSD	18,739
CPU Cooler	Noctua NH-D15	7,299
Monitor	ASUS PB279Q 4K UHD	62,500
Graphics Card	ASUS Strix GTX 980	44,590
Cabinet	Corsair Obsidian Series 750D	11,138
PSU	Antec HCP-1000 Platinum 1000 W	15,148
Speakers	Logitech Z906 5.1	18,790
Optical Drive	LG Blu-ray WH16NS40 RW	5,885
Mouse	Razer Death Adder 2013	3,399
Keyboard	Corsair Vengeance K70 RGB	12,637
Sound Card	ASUS Xonar D2X 7.1	8,800
Total		₹2,63,712

HTPC

Processor	Intel Core i3-4150	7,090
Motherboard	MSI B85M-G43	5,750
RAM	G.Skill RipjawsX DDR3 4 GB (2 x 2 GB) PC RAM (F3-12800CL9D-4GBXL)	2,983
HDD	Western Digital WD30EZR 2 TB	6,490
Graphics Card	None (IGP HD4400)	0
PSU	Corsair VS350	2,200
Speakers	None	0
Optical Drive	Samsung SH-224DB/IDDS	925
Mouse	Logitech MK220 Wireless Combo	1,095
Keyboard	Bundled	0
Sound Card	None	0
Monitor	None (your TV)	0
Cabinet	Silverstone Sugo Series SST-SG02B-F-USB3.0	3,750
Total		₹30,283

MID-RANGE GAMING

Processor	Intel Core i5-4440	11,190
Motherboard	ASUS B85M-G	6,571
RAM	G.Skill SNIPER F3-12800CL9D-8GBSR1	5,408
HDD	Toshiba 1 TB DT01ACA100	3,450
Graphics Card	HIS R9 270X 2 GB	12,190
PSU	Seasonic S12II 620 Watts	6,000
Speakers	F&D F680	2,647
Optical Drive	Samsung SH-224DB/IDDS	925
Mouse	E Blue Cobra Advanced Combo (Bundle)	2,999
Keyboard	E Blue Cobra Advanced Combo (Bundle)	0
Sound Card	None	0
Sub-total	(Excluding Monitor and Cabinet)	51,380
Monitor	Dell S2240L	8,276
Cabinet	Antec X1-T Gaming	2,750
Total		₹62,406

PRIMARY DIGIT TEST RIG

Processor	Intel Core i7 - 4960X (Extreme Edition)	70,159
Motherboard	ASRock X79 Extreme 9	27,846
RAM	Corsair Dominator 2133MHz (8 GB x 4) (CMD32GX3M4A2133C9)	48,500
HDD	Toshiba DT01ABA100V	3,450
SSD	SanDisk Extreme II 240 GB (x2 for HDD testing)	24,798
PCIe SSD	Kingston HyperX 480 GB	28,999
CPU Cooler	Intel RTS2011LC	NA
Graphics Card	NVIDIA GeForce GTX TITAN X	85,099
Cabinet	NA	NA
PSU	Corsair HX1050	16,291
Monitor	ASUS PB279Q	62,500
Optical Drive	NA	NA
Mouse	Razer Ouroboros Elite	10,989
Keyboard	Tt eSPORTS Poseidon Z	8,099
Total		₹3,86,730

Agent001

Thinking of getting a multimedia streamer? Agent001 has a few wise words for you.

**Watch? Or a tracker?**

This device looks like a watch but is actually an analog activity tracker: <http://dgit.in/1Jv000b>

SPEND SMART

Point-and-shoot cameras, TVs, laptops and budget smartphones.
Time for some summer shopping.



POINT AND SHOOT CAMERAS UNDER ₹15K

Brand	Model	Max Resolution	Optical zoom	Weight (With battery)	Price (in ₹)
Pentax	Efina Plus	14 MP	5x	128 g	2,999
Nikon	L29 Point and Shoot	16 MP	5x	160 g	4,390
Nikon	CoolPix S2800	20.1 MP	5x	120 g	5,300
Canon	Digital IXUS 160	20 MP	8x	127 g	5,456
Sony	CyberShot DSC-W810	20.1 MP	6x	120 g	6,399
Nikon	Coolpix S3600	20.1 MP	8x	125 g	6,450
Sony	CyberShot DSC-W830	20.1 MP	8x	125 g	7,549
Canon	Digital IXUS 170	20.1 MP	12x	141 g	7,796
Sony	CyberShot DSC-WX80	16.2 MP	8x	124 g	9,350
Canon	Powershot SX400	16 MP	30x	313 g	9,490
Canon	Powershot SX600 HS	16 MP	18x	188 g	10,390
Nikon	CoolPix L340	20.2 MP	28x	430 g	11,299
Sony	CyberShot DSC-H300	20.1 MP	35x	495 g	13,490
Fujifilm	S4500 Point and shoot	14 MP	30x	543 g	13,500
Canon	PowerShot SX610 HS	20.1 MP	36x	191 g	14,395



TVs UNDER ₹50K

Brand	Model	Display size	Screen type	Ports	Native Resolution	Price (in ₹)
LG	24LB452A	24-inches	LED	1x HDMI, 1x USB	1366x768	12,990
Micromax	32B200HDI	32-inches	LED	2x HDMI, 1x USB	1366x768	15,490
Toshiba	32P2400	32-inches	LED	1x HDMI, 1x USB	1366x768	18,490
Micromax	40T2810FHD	40-inches	LED	2x HDMI, 1x USB	1920x1080	22,990
LG	32LB515A	32-inches	LED	2x HDMI, 1x USB	1366x768	23,990
Onida	LEO4000F	40-inches	LED	2x HDMI, 2x USB	1920x1080	26,990
Videocon	VJU40FH	40-inches	LED	2x HDMI, 2x USB	1920x1080	27,990
LG	32LB5610	32-inches	LED	2x HDMI, 1x USB	1920x1080	29,990
Sony	KLV-32R412C	32-inches	LED	2x HDMI, 1x USB	1280x800	30,900
Samsung	32J5300	32-inches	LED	2x HDMI, 2x USB	1920x1080	34,990
Micromax	42C0050UHD	42-inches	LED	2x HDMI, 2x USB	3840x2160	37,490
Samsung	40H5000	40-inches	LED	2x HDMI, 1x USB	1920x1080	42,990
Vu	48D6455	48-inches	LED	3x HDMI, 4x USB	3840x2160	47,990



Remnants of tragedy

A lost climber's belongings found thirty years after an avalanche:

<http://dgit.in/1JvSRPd>



Tracking your wine

Everyvine is an app that helps you locate and IDENTIFY vineyards that Google maps can't.

<http://dgit.in/1EUHTwh>

Price Watch



LAPTOPS UNDER ₹50K

Brand	Model	Processor	RAM	Display Size (inches)	Screen Resolution (inches)	Storage (GB)	Price (in ₹)
Micromax	Canvas Laptab	Intel Atom (4th Gen)	1 GB	10.1-inches	1366x768	32	15,000
Asus	Eeebook X205	Intel Atom (4th Gen)	2 GB	11.6-inches	1366x768	32	15,000
Lenovo	S20-30	Intel Celeron (4th Gen)	1 GB	11.6-inches	1366x768	500	19,650
HP	245 G2	AMD A4-5000	2 GB	14-inches	1366x768	500	19,990
Dell	3000/3137C2500iS	Intel Celeron DC (4th Gen)	2 GB	11.6-inches	1366x768	500	23,000
Asus	X200LA	Intel Core i3 (4th Gen)	2 GB	11.6-inches	1366x768	500	23,990
Acer	One S1001	Intel Atom (4th Gen)	2 GB	10.1-inches	1366x768	500	23,495
Asus	C300MA-R0003	Intel Celeron (1st Gen)	4 GB	13.3-inches	1366x768	32	25,888
Toshiba	Satellite C50-A-I0013	Intel Core i3 (3rd Gen)	2 GB	15.6-inches	1366x768	500	26,900
HP	Pavilion 10-e007AU	APU A4-1200	2 GB	11.6 (Touchscreen)	1366x768	500	27,490
Asus	X550CC-XX922D	Intel Core i3 (3rd Gen)	4 GB	15.6-inches	1366x768	500	28,500
Acer	V5-122P/NX.M8WSI.008	APU Dual Core A4	2 GB	11.6 (Touchscreen)	1366x768	500	29,000
Lenovo	Flex 2-14D	APU A6-6310	4 GB	14.1-inches	1366x768	500 (8 GB SSD)	30,490
HP	11-n032tu x360	Intel N3540 Pentium (4th Gen)	4 GB	11.6 (Touchscreen)	1366x768	500	34,999
Dell	Inspiron 3546	Intel Core i5 (4th Gen)	4 GB	15.6-inches	1366x768	1000	36,800
HP	11-n109tu x360	Intel Atom (5th Gen)	4 GB	11.6 (Touchscreen)	1366x768	500	37,190
Lenovo	Z-50 59-442262	Intel Core i5 (4th Gen)	4 GB	15.6-inches	1920x1080	1000	42,200
Lenovo	G50-80	Intel Core i5 (5th Gen)	4 GB	15.6-inches	1366x768	1000	42,237
HP	15-r014TX	Intel Core i5 (4th Gen)	4 GB	15.6-inches	1366x768	500	43,411
HP	Pavilion 15-p204tx	Intel Core i5 (5th Gen)	4 GB	15.6-inches	1366x768	1000	45,065
Lenovo	Flex 2-14	Intel Core i5 (4th Gen)	4 GB	15.6-inches	1920x1080	500	46,890
Lenovo	ThinkPad Ultraportable x2042	Intel Core i3 (4th Gen)	4 GB	14-inches	1366x768	500	47,990
Dell	Inspiron 5547	Intel Core i5 (4th Gen)	8 GB	15.6-inches	1366x768	1000	48,938
Apple	Macbook Pro MD101HN/A	Intel Core i5 (3rd Gen)	4 GB	13.3-inches	1280x800	500	51,934
Acer	E1-572G (NX.MJNSI.004)	Intel Core i7 (4th Gen)	8 GB	15.6-inches	1366x768	1000	52,999



SMARTPHONES UNDER ₹15K

Brand	Model	Operating System	Screen size	Primary Camera	RAM	Internal memory	Battery	Price (in ₹)
Xiaomi	Redmi 2	Android KitKat 4.4	4.7-inches	8 MP	1 GB	8 GB	2200 mAh	6,999
Motorola	Moto E (2nd Gen 4G)	Android Lollipop 5.0	4.5-inches	5 MP	1 GB	8 GB	2390 mAh	7,999
Lenovo	A7000	Android Lollipop 5.0	5-inches	8 MP	2 GB	8 GB	2900 mAh	8,999
Micromax	Yu Yureka	Cyanogen 11 (Android 4.4.4)	5.5-inches	13 MP	2 GB	16 GB	2500 mAh	8,999
Asus	Zenfone 5	Android KitKat 4.3	5-inches	8 MP	1 GB	16 GB	2110 mAh	9,999
Xiaomi	Redmi Note 4G	Android KitKat 4.4.2	5.5-inches	13 MP	2 GB	8 GB	3000 mAh	9,999
Xiaomi	Mi 4i	Android Lollipop 5.0	5-inches	13 MP	2 GB	16 GB	3120 mAh	12,999
Nokia	Lumia 730	Windows Phone 8.1	4.6-inches	6.7 MP	1 GB	8 GB	2220 mAh	13,671
HTC	Desire 626G	Android KitKat 4.4.4	5-inches	13 MP	1 GB	8 GB	2000 mAh	14,749
Asus	Zenfone 2 ZE551ML	Android Lollipop 5.0	5-inches	13 MP	2 GB	16 GB	3000 mAh	14,999



Did you Know?

There is a parasite that can take over a spider's brain and control it. Read more : <http://dgit.in/1EWJxOW>



Course Correcting Bullets!

DARPA is working on a bullet that can correct its course when misfired. <http://dgit.in/1Ee1mYn>

Media streamers

Love them or hate them, you just can't live without them. Anymore.

Agent 001
agent001@digit.in

Whether it's making a dumb television smart or simply pushing onto its big screen off your connected devices, the ubiquity and convenience of media streamers can't be ignored anymore. I remember a time not too long ago when playing digital media through your television required you to jump through several taxing hoops. Not anymore. Times have changed and TVs these days support USB based digital media playback or one through HDMI, for that matter. Streaming, slinging, flinging, casting, airplay-ing media files



straight from a mobile device or any other medium is the name of the game.

Size no bar

Right now these streaming receivers come in all shapes and sizes, from slim sticks that resemble a USB pen drive (powered through a micro-USB cable) to slightly larger ones capping out at lunchbox sized streaming players that draw power through the wall socket and need more juice to work with. Larger streamers have a lot more connectivity options and their antenna is capable of better range. Also,

high-powered SoCs can run without being underclocked on boxes while the sticks are generally limited to 600 MHz or so.

Pay attention to protocols

Miracast has been around for quite a long time and has been integrated into Android 4.2+ and Windows 8.1, but there is this major drawback while playing media off the internet on your mobile device which is then Miracast to your TV – not enough bandwidth. Airplay is more intelligent in fetching media making it less prone to losing packet data – but it's only restricted to Apple devices for now. DLNA is still the way to go, the protocol is a lot more standardised so you can expect two devices that support it to work without any quirks, unlike Miracast. DIAL (Discovery And Launch) is a relatively new protocol developed by YouTube and Netflix which seems to be dying off; mDNS (Multicast Domain Name System) which works in a similar fashion seems to be rising up from DIAL's ashes. Ultimately, I believe hosting a media server is the most convenient way to stream media across multiple devices because pretty much every platform has an app.

Playing field

There's plenty of streamers to pick and choose from. Recently, I've tried the Roku Streaming Stick 3500R, Google's Chromecast and quite a lot of EZCast based dongles. Ematic's Mediabeam, Merlin-Digital's Screencast and Cubetek Air Streamer are also right up there, so is Amazon's Fire TV Stick and the recently launched Teewe 2 which sells for just ₹2,399 and plays all kinds of formats like MP4, MP3, AVI, JPEG, PNG, MKV, AVI, FLV like a charm.



Android devices generally have Miracast support without requiring any external apps



Rotting inspiration!

Goethe could not write unless he had a rotting apple on his desk.
<http://dgit.in/1LdnRTe>



The Raspberry Pi 2 coupled with OpenELEC is all you need

Minix Neo boxes are great, extremely versatile. The X8-H Plus hardware is way ahead of the competition as it has a card reader, OTG port, three USB ports, a detachable antenna, ethernet port and provision for analog and digital A/V output. The only sore point? Its cost.

Building your own streaming stick

With the low-cost advantage of a Raspberry Pi, DIY enthusiast can make their own video streaming server. It's not that hard. Just choose a variant of KODI and start adding apps to enhance the experience. KODI works seamlessly with a lot of devices without the need to too much customisation as is the case with most linux distros. The interface is easy to understand and you can use your Android phone as a remote.

If you wait till Windows 10 rolls out, which is going to be sometime this year, each Raspberry Pi 2 gets a lean version of the OS for free, meant for casting and streaming. All you need is a Wi-Fi adapter (TP-Link), 8 GB Sandisk Ultra MicroSD card for the OS image. KODI does have Airplay support straight out of the box, in case you have an Apple device to stream on to.



KODI is what most media centre linux distros are based on

So, yeah, if it were up to nerds to look at all that we have at our disposal, it would be very difficult to pass on the Raspberry as a complete package to build your own streaming server so to speak. ■

INDIE ZEN FOR DUMMIES

You wanna be an Indie Game Dev? A rogue, a ronin in a world full of multinational companies. Great. Here are my thoughts after more than 10 years working as a freelance author and game designer:

THE FOUR NOBLE TRUTHS OF INDIE GAME DEV

- #1: The Indie Life is all about Suffering.
- #2: You perfectly know the sources of this Suffering. The tax system, the difficulty to find contracts, your own doubts, etc. And trust me: all of this suffering starts from day one.
- #3: We can put an end to all Suffering by identifying its Origin.
- #4: To accomplish this, you just have to take the Eightfold Path.

THE EIGHTFOLD PATH

First, you need to acquire wisdom by having the Right View and Intention. The Right View isn't only about having a great understanding of the video games industry, but first and foremost about having understood your own capacities. The Right Intention is to know why you want to be an Indie. What do you want to achieve? Make a lot of money? Obtain glory? Have fun? Just try to find something meaningful for yourself.

Second, you need to follow an ethical conduct. Starting with Right Speech, first. Because you are your own company, don't mess with your conduct and your attitude when you meet people. Also, always honour a contract. Your word is your bond. Never forget about it. By taking the Right Action: always act carefully. No matter the decision, think twice, choose and move on. Most of the time, the Right Action is to act. Stagnation is Death. Choose to have a Right Livelihood. Believe me, a rupee is a rupee. Never pour money down the drain. Never. Even and especially if you have some. Also, always take care of yourself. If you are exhausted, take a break.

Third, you need to improve your concentration. Always make the Right Effort. Don't waste time. If you think that you have some, think twice. Why not start another project? Why not improve your skills? Also you must have the Right Mindfulness. By Mindfulness, I mean focus. You must always stay focused on your objectives. Having a meaningful Right Intention at the start of your journey helps a lot. Finally, you will acquire the Right Concentration and you will be aware of every small details of both your professional and personal life.

THE ENLIGHTENMENT?

Being an Indie game dev is a real Journey. Both a professional and a personal one. Embracing the Four Noble Truth and following the Eightfold Path doesn't protect you from failure but, for sure, it will allow you to do your best and to make this journey a wonderful and meaningful one. *Om mani padme hum.* ■



Pierre Pradal, Game Designer Trainer, DSKIC

Image courtesy from Norbert Cellier.
All rights reserved.



Time for some music

Old-school speakers are no more a problem, thanks to these gadgets:
<http://dgit.in/1Fwh8os>



Power of imagination

This \$19 gizmo turned a doughnut into a keyboard. Click here to know more:
<http://dgit.in/1B9nIdp>

Laptop for around ₹50k

Dear Agent 001, I am looking forward to buying a laptop in the range of ₹50,000 or less. Could you help me with some models I can speculate on? Please help!

– Suresh Tripathy

A A price range of ₹50,000, Suresh, can get you an entire array of laptops specialising in different tasks depending on their configurations.

Let me streamline it for you. If your daily use is limited to surfing through the Internet, Microsoft Office, checking mails and watching movies, then you might not have to spend the kind of money you mentioned above, at all. For example, you can consider devices in the range of ₹30,000 to ₹35,000. The HP Compaq 15-s105TU Notebook, loaded with a 4th gen i5 processor, 4 GB RAM and 1 TB storage should be one apt option for you. Other options in this range include the Lenovo B40-70 Notebook, the HP 4430s Probook and the Dell Inspiron 15 3542 Touch Screen Laptop. However, these versions come with an Intel Core i3 instead of an Intel Core i5, which shouldn't really be a problem.

However, if you're looking for a laptop that delivered an uninterrupted gaming experience or HD video streaming, you might want to tread a little ahead in the ₹45,000-50,000 category as you will need a processor of the likes of a 4th-gen Core i5 or perhaps, even the i7.



Lenovo B40-70

But, what matters here is the graphics card. The Lenovo 2-14 Notebook, loaded with a 4th gen Core i5 and a N15V-GM graphics card should do the trick. For a laptop loaded with such awesome specs, it weighs a mere 1.9 kilograms, making it a more viable option in the price bracket. The HP Pavillion 15-p206tx Notebook and the Dell Vostro 3546 Notebook are other befitting options. So here are your options, do let us know which laptop you decided to get.

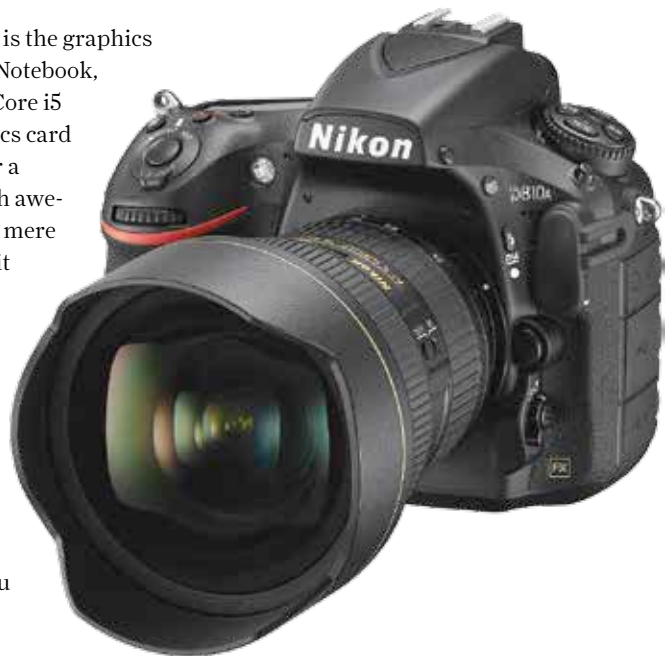
Astrophotography beckons

Dear Agent 001, I am a student who has garnered an interest in astrophotography. What kind of gadgets can I use to further enhance this interest?

– Kannankatil S

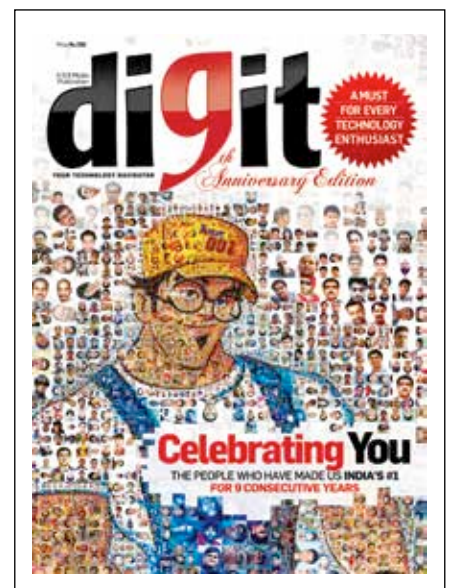
A Dear reader,

It's great to know you're interested in astrophotography. There's a lot of equipment involved and you don't want to befuddle yourselves or burn a hole in your pocket. To start with, a decent mid-range DSLR like the Canon 70D or the Nikon D7100 would fit the bill, along with a tripod. These two are a must if you want to get started. There are also specialized cameras meant only for astrophotography like the EOS 60Da from Canon and the D810A from Nikon but they are meant for experienced users. After you've learned the basics of astrophotography, you'll want to invest in an Equatorial Mount, which is used in tracking the sky's motion and is used extensively here. A good EQ mount with computerized tracking systems



The Nikon D810A was designed specifically for astrophotography

lets you navigate the stars easily and adjusts itself based on the movement of the sky. Upgrading your camera lenses, buying intervalometers and special filters is also not a bad idea. Expect to pay a total of about ₹1,50,000 for everything when beginning (Adding an EQ mount would double that price). From there, depending on how interested you are, the cost can go up by a few lakhs. I hope this answers your query. **d**





INNOVATE FOR DIGITAL INDIA CHALLENGE



Supported by **MyGov & DeitY**.
Anchored by **CIIE, IIM-A**.

THE INDIA YOU SEEK, SEEKS YOU.

Solutions Made by You, Made for India.

The Government's bold Digital India vision aims to empower every Indian citizen with the power of technology to drive universal access to education, healthcare and services that are key for inclusive growth and development.

The biggest challenges to the realization of the vision include ensuring last mile access to broadband, digital literacy and availability of solutions that are relevant for the diverse lifestyles, cultures and values across India. All three have to be addressed in order for Digital India to become reality.

Intel has been working with the Government and ecosystem to scale digital literacy throughout the nation under its Digital Skills for India initiative and is pleased to take the same Public Private Partnership approach to foster innovation in India to drive development of solutions that will help to increase technology adoption in India by addressing real issues/challenges faced by society.

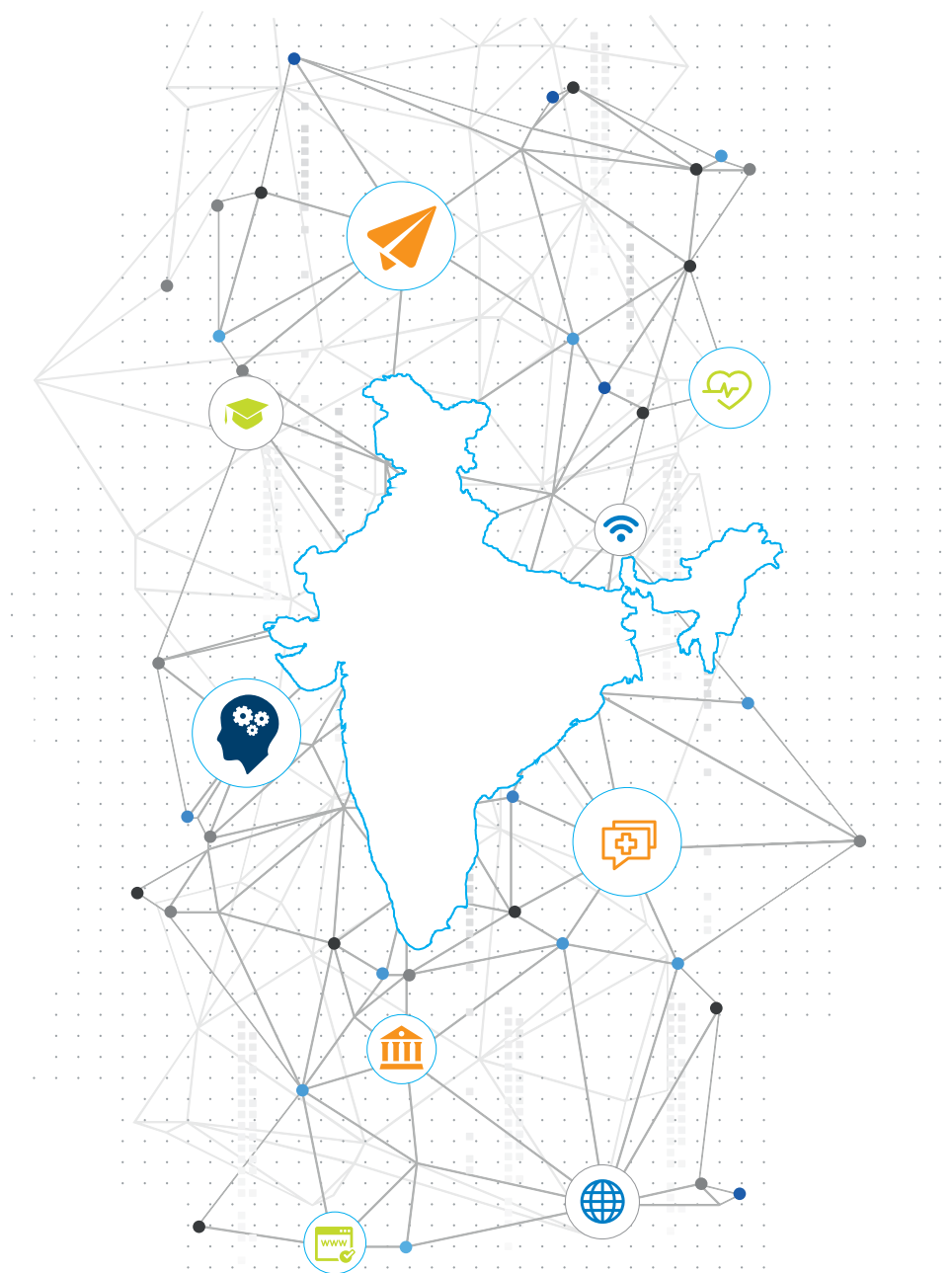
As part of Intel's agenda to foster innovation, Intel announced in collaboration with the Department of Science and Technology the **Intel & DST - Innovate for Digital India Challenge**, supported by MyGov and Department of Electronics and Information Technology ("DeitY") and anchored by Center for Innovation Incubation & Entrepreneurship (CIIE, IIM-A).

The Challenge seeks to combine Intel's history of game changing innovation and world-class technology with the Government's bold Digital India vision and the immense entrepreneurship talent in the country to create a sustainable tech ecosystem that will develop products and solutions keeping in mind the real challenges to meaningful usage of technology in the country.

OBJECTIVE OF THE CHALLENGE

The Challenge aims to encourage the creation of intuitive, easy to use products and solutions that enable and drive access to services imperative for development. Some of these critical services include Financial services, Healthcare, Education and e-Governance. We seek participation from innovators who can develop products and solutions around two broad areas:

1. **Innovation to create citizen's device platform** with features that are relevant and drive mass adoption of technology such as biometric sensing capabilities, peripherals using other sensors, intuitive user interface, gesture recognition, and multi-lingual & voice support.



2. **Innovation to create apps** that accelerate delivery of e-governance services through eKranti/MyGov apps on mobile platform.

5. Industry connect across various phases for expert inputs, field immersion and production considerations.

WHAT'S ON OFFER?






1. 3-month accelerator program in Bengaluru and Pune
2. Access to grants & equity investments of up to INR 1.5 Cr#.
3. Product design inputs, access to FabLabs, 3D printing, rapid prototyping
4. Product kits based on Intel® Architecture for development of MVPs.

WHO'S ELIGIBLE?

The Challenge is open to innovators, aspiring entrepreneurs, product designers, students and startups alike that are Indian resident nationals. Startups or business entities entering the Program must have been formed in and in accordance with the laws of India. Participants are required to be at least 18 years of age on 1st June, 2015.

KEY PHASES

Participants have the opportunity to go through multiple phases to bring their ideas to life. The key phases~ of Intel & DST - Innovate for Digital India Challenge are as follows:

PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5
 <p>Application Last date for entry: 22nd June, 2015</p>	 <p>Accelerator Program July to Sept, 2015</p>	 <p>GTM Preparation & Prototype Day Sept to Nov, 2015</p>	 <p>Early Adopter Interaction & Pilot Nov'15 to Jan'16</p>	 <p>Demo Day & Showcase In January, 2016</p>
Up to top 50 participating teams to present their concepts at IIM-A.	12 weeks of mentorship in Bengaluru & Pune to develop Minimum Viable Products (MVP) based on Intel® architecture	Up to top 10 participating teams will have access to development grant of up to INR 5,00,000 per team.	Up to top 10 teams to receive additional mentoring by industry players and field immersion experience with select companies.	Up to top 10 final teams to showcase their products to key market players on Demo Day.
Up to 20 participating teams to be selected for the Accelerator program.	Up to top 20 teams to receive prototyping grant of up to INR 2,00,000 per team.	Participating teams to showcase their MVPs to industry experts for feedback as part of the Prototype Day.	Identification of up to top 3 teams and initiation of due diligence process for providing access to equity investment.	Showcase event to announce up to top 10 finalists and top 3 teams along with hand shake with industry players for productization.
	Up to top 10 participating teams will be identified during this phase	Interaction with Design House.		Subject to successful completion of due diligence, up to top 3 selected teams will have access to equity investment of up to INR 20,00,000 per team.

For more info on the Challenge and to apply, visit

www.innovatefordigitalindia.intel.in

Entries close 22nd June 2015, @6 pm IST

Participants are requested to read the terms & conditions on www.innovatefordigitalindia.intel.in carefully
Intel & DST – Innovate for Digital India Challenge is sometimes referred to as the "Challenge" in this document.
Cumulative amount.

~ Timelines are subject to change without prior notice. Participants are recommended to read the Terms & Conditions on www.innovatefordigitalindia.intel.in carefully.

CHALLENGING THE CHALLENGE

One of the biggest challenges in India is the lack of pervasiveness of knowledge and technology across the vast expanse of this country. Ensuring a well-connected India with access to broadband in the farthest corner; digital literacy; and availability of solutions that enhances every citizen's livelihood are the primary measures to be taken for Digital India.

Bringing about a revolution in Digital literacy is one of the three vision areas as part of the Digital India plan. The only way to tackle this problem is to provide universally available digital solutions that can be easily accessible in Indian languages and can be used from any remote corner of the country. The focus obviously needs to be on providing portability through the cloud and fostering collaborative platforms to enable participative governance and growth.

Intel has been working with the Government and eco-system to scale digital literacy throughout the nation under Intel's Digital Skills for India initiative, through which Intel is committed to train 5Mn people with digital literacy skills by the end of 2015. From secured and managed digital infrastructure in Data Centers for storage, connectivity, data transfer, and analytics; Accessible, Affordable Computing Devices & Solutions with High

Performance Computing devices; to Skill Development & Capacity Building through the various initiatives and programs, Intel is accelerating Indians with its innovations and making India digital.

INTEL'S COMMITMENT TO IMPROVE DIGITAL LITERACY VIA DIFFERENT INITIATIVES

Intel is enabling citizens of India to be digitally literate. The programs designed to equip them

with digital skills include Intel® Teach Program that has trained over 18 lakh teachers in India to use technology for the past twenty years; Intel® Learn Easy Steps that helped in spreading digital literacy to 38 lakh people under National Digital Literacy Mission, which is co-founded by Intel; and Intel® Digital Skills Training Application, which is comprised of Digital Literacy, Financial Inclusion, Healthcare and Cleanliness in 5 Indian languages. Intel has also launched an initiative, in association with Bharat Broadband Network Limited, that aims at imparting digital literacy to key resource persons in the first 1000 Panchayats under the National Optic Fibre Network roll-out in India.

Intel has been fostering innovation since its inception. Driven by Moore's Law, it has been initiating various programs that create huge economic value and drive social advancement for over two decades in India. The milestones achieved are reflected in the success of Intel® International Science and Engineering Fair that has had over 180 winners, with 18 of them receiving the honour of having minor planets named after them; Intel® Higher Education Program, which promotes innovation and entrepreneurship, and has reached 235,000 students and 4,500 faculties across 550 institutions so far; and Intel® PhD Sponsorship program that looks forward to enhance the quality of research in the nation.

The Intel® International Science and Education Fair for 2015 was completed on 15th May with awards being given out to 9 Indian Students across various categories. A total of 17 students from India were selected for the Intel® ISEF from the National Science Fair held by Initiative for Research and Innovation in Science. The top prize for \$75,000 i.e. the Gordon E. Moore Award, went to Raymond Wang, 17, of Canada. Onkar Singh Gujral, 18, of La



Martiniere for Boys in Kolkata, won the Association of Computing Machinery first award and the second award in the System software category for his entry on image processing algorithms for detecting nanomaterials.

These are some of the other winners from schools in India:

1. Mansi Aggarwal, 17, and Harshit Jindal, 14, of Maharaja Agarsain Public School, Delhi: Fourth Award in Plant Sciences category for research on "An Effective Herbal Ointment against Enterobiasis"
2. Ravi Pradip, 17, of Dayapuram Residential School, Kozhikode, Kerala: Third Place in Material Sciences for work on "Plumeria Blooms for Organic Electronics"
3. Arsh Shah Dilbagi, 17, of DAV Public School, Panipat, Haryana, Third Award in Embedded Systems category for developing "TALK-An AAC Device: Converting Breath into Speech for the Disabled"
4. Aditya Bhargava, 16, and Komal S, 16, of Sharada Vidyanikethana Public School, Mangalore, Karnataka: Fourth Award in Material Sciences for work on "Highly Sensitive Nano-Ferrite for Detection of Carbon Monoxide in Air"

Not only in India, but internationally, Intel has been conducting the Intel® International Science and Engineering Fair (Intel ISEF), a program of Society for Science & the Public (SSP). This has come out to be the world's largest international pre-college science competition. Approximately 1,700 high school students from over 75 countries, regions, and territories are awarded the opportunity to showcase their independent research and compete for approximately \$4 million in prizes.

Intel® ISEF unites these top young scientific minds, showcasing their talents on an international stage, where doctoral level scientists review and judge their work. SSP partners with Intel – along with dozens of other corporate, academic, Government and science-focused sponsors – who provide the support and awards for Intel ISEF.

INTEL® INDIA EMBEDDED CHALLENGE

The focus of Intel® India Embedded Challenge is on designing embedded solutions around a wide range of application areas. As a part of the Intel® Higher Education Program, this competition enables and mentors young innovations to scale up their level of thinking and creativity. Moreover, Intel® IEC offers a strong mentorship platform where Intel technologists volunteer their time



Former President of India Dr A P J Abdul Kalam with Team India prior to their departure for Intel ISEF 2014

and expertise to mentor each team to develop and prototype their innovation using hardware platforms provided by Intel. The participants in this contest get to architect, design and develop novel embedded applications in areas such as – Consumer Electronics, Digital Security Surveillance, Medical, Education, Storage and In-Vehicle Infotainment amongst others.

Intel conducted its 4th Intel® India Embedded Challenge in December 2014, where it received 2400 registrations out of which 650 innovative ideas were shortlisted and 40 prototypes were displayed at the Intel® India Innovation Conclave. The Intel® IEC finalists were mentored by over 50 technologists from Intel India.

TECHNO GIRLZ INITIATIVE

Intel also partnered with the Government of India to launch an education initiative on children's day in November 2014, called "Techno Girlz" which aims to encourage young girls towards scientific endeavours by inculcating scientific aptitude, spur creativity and foster the spirit of innovation amongst their young minds. Staying true to the commitment of Digital India, the program entailed conducting 10 winter camps to reach 1000 girls (K4-K9 grades) in 10 cities across the country, enhancing skill development and building intellectual capacity among girls at an early age. In addition to that, an impact study was undertaken to assess the skills learnt and the behavioral changes in the young minds after attending these workshops.

Techno Girlz is targeted to transform the thought process of young students by building awareness about Do It Yourself (DIY) culture through play and learn activities in order to spur creativity and a spirit of invention. The initiative is intended towards fostering scientific temperament by accessing the kids' ingenious bent of mind and encouraging them towards Science, Math, Engineering, and Technology (STEM) studies. Techno Girlz, in association with Government Schools for girls across the country, conducted workshops with the help of the subject experts. The workshops included hands on enrichment sessions that would guide the students to come up with Creative Technology based designs.

EXPANDING REMOTE CONNECTIVITY WITH INTERNET OF THINGS

Internet of Things is the next level of evolution towards developing connected devices. With the help of unique hardware and developer kits along with sensors available from Intel, one



From Left to Right: Professor Rakesh Basant, chairperson, CIIE; Ms. Debjani Ghosh, vice president, Sales and Marketing Group and managing director, Intel South Asia; Shri H K Mittal, Member Secretary, National Science and Technology Entrepreneurship Development Board (NSTEDB); Vikas Jain, co-founder, Micromax Informatics and Shri Gaurav Dwivedi, CEO, MyGov.in

can create smart devices that connect with each other resulting in innovative solutions to tackle challenges like you never imagined before.

This is especially important in the context of the Digital India transformation, where cheap and easy to use technology solutions are needed in order to create intuitive, easy-to-use products that enable and drive access to services imperative for development. Some of these critical services include Financial services, Healthcare, Education and E-governance. The Intel & DST - Innovate for Digital India Challenge too is seeking participation from innovators who can develop products and solutions for such verticals.

Such devices are expected to revolutionise the way people in remote villages and other places connect with technology.

Another Intel® technology called the Intel® Edison platform also comes into the picture in the context of IoT. It is a solution designed to lower the barriers to entry for quick prototyping and productizing the connected computing devices driving the next industrial revolution. Intel® Edison technology was designed specifically for the creators of these devices – emerging entrepreneurs eager to invent the future. It combines a small, powerful, adaptable hardware platform and partner-enabled ecosystem with extended software compatibility and supportive online environment.

Intel is also hosting 20 Intel® IoT Roadshows for maker communities in cities across US, Europe, South America and Asia. This two-day hackathon is open to all including makers, IoT startups, developers, students and hardware novices. Participants will get a free Intel® IoT Developer Kit which will include an Intel® development board. The Dev-kit is based on Intel® Architecture and designed to be hardware and software pin-compatible with Arduino. It is also well-equipped with sensors, software and accessories to stimulate one's creativity. Intel® Software recently concluded its two-day Intel® Internet of Things (IoT) roadshow on 11th and 12th April 2015 in Bengaluru. 153 makers and pro-makers came together at this 24 hour hackathon to build IoT enabled solutions. 45 IoT solutions were created using Intel® IoT Developer kits which includes an Intel® Edison board which is an Arduino-compatible development board featuring Intel® Architecture.

The winner, DriveAlert, created a smart IoT enabled solution to prevent mishaps due to drowsy driving/ flying and enhancing driver efficiency using their driving data. The solution will not only help detect drowsy driving but also improve driver's efficiency by using the captured data. The device will capture behavior patterns of the driver and his interaction with the components of the vehicle. This gathered data will be then used to give the driver a feedback, in turn improving his efficiency. ■

ISSUE

You've been sitting on your ass for long enough. It's time to get up and do something this summer. We show you how you can become a Digit level reviewer. Find out how you can test everything from monitors, projectors and smartphones on the spot and become a tech guru.

Illustration:
Anil T

HOW YOU TEST

We've given you a separate Digit book dedicated to stuff to DO. However, one of the most important services Digit provides to you is imparting knowledge, especially when it comes to telling you what to buy and why. We've done this over the years in the form of comparison tests, bazaar reviews, online reviews, video reviews, etc.

We're not impressed by popularity, price or perception – we never have been, and encourage you to not be either. What really matters for all products, across all categories, is actually simple – they should have all the features you need (some of which you'll need later) and not be ridiculously priced, so as to give you the best value for your hard-earned money.

How do we do this? We test. Rigorously. We dare say that we're a lot harsher on products than most others, and we're actually going to get even rougher on products going forward. You already know why this is needed: the performance difference between products is decreasing, with most of them made in China, at identically specced fabrication units and with almost identical product designs. It's a me-too world and true innovation is indeed rare.

However, with this issue, we're going one step further than vanilla buying advice and giving you our own testing secrets, to try to get you to think like an experienced Digit Test Centre reviewer. Why? Because unlike us, you don't have brands sending you their products to test. There are really three ways by which you can tell a good deal from a bad one: First, one of your friends happens to have the product you want and you're able to get your hands on it to check it out and even run benchmarks; the second way might be if you come across the product displayed in a store where you're allowed to fiddle with it to try it out, and hopefully also

run a few benchmarks there; the third, however, is the most common way you'll compare products, and that's by looking at its specs and reviews online, and trying to decide whether it's worth throwing money at.

The first question we were asked when planning this cover story was, "If I trust Digit and the way it ranks products, why should I need to know any of this." The simple answer: because your needs are becoming more unique, and although we can account for most of those needs, we can't account for all of them. Besides, this is a good chance for us to show off how much thought and planning goes into what's usually considered a "simple review".

In the pages that follow, we're going to attempt to impart enough knowledge for you to be able to do better at ranking products no matter which of the three scenarios you find yourself in. Of course, we want you to write in to us and let us know how we did, what we missed and also elaborate on any specific category. Send feedback to editor@digit.in as always...

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Smartphones are all the rage today as the market is oversaturated with multiple devices and this is why we test them intensively to give you the best recommendations. Learn how we do it.

By **Prasid Banerjee**

This issue of Digit has a plethora of buying guides, but let's face it, none of them are really as important as smartphones. These nifty little gadgets are what most of us buy today, irrespective of where we are and whether we're actually going to use them to their full potential. Smartphones today are powerhouses, with a lot of computing power and functionalities. For a basic user, a smartphone can actually replace a laptop and computer, allowing him or her to do everything on a smaller screen.

Also, compared to all the other tech mentioned here, smartphones are bought online most frequently. Why is this important? Because while buying online, you can't really do the tests that you can do in a retail store. Knowing the specifications is not enough, one has to actually know what they mean. Getting confused aren't you? Don't worry, we'll make all of it very clear for you. Read on!

Buying Online

While the following is meant for online buyers, the information is just as important if you're buying from a retail store.

Processor

In a PC or laptop, the processor is of the utmost importance, it ensures that you'll

get a decent experience out of your device and more importantly, that your laptop or PC will be future proof. It's not exactly that simple with smartphones. Processors become obsolete on smartphones much faster than they do on PCs, but that doesn't mean you can't future proof your device.

Speaking from personal experience, a Moto X (1st Gen) bought in 2014, is very much usable right now, and it will be till at least the next year. That doesn't mean



you should buy one right now though, not unless you're getting it at less than half of its original price. Smartphone processors ensure your phone can take everything that you throw at it. The easiest way to gauge the performance is by going through reviews, from both reviewers and device users alike.

But what happens when you can't find reviews for the phone that your heart

desires. Pick the closest competitor for comparison. For example, if you're picking the Xiaomi Mi4i, pick another device that runs on the Snapdragon 615 SoC and focus on its performance alone. It won't tell you exactly how the Mi4i will perform, but it will give you a very good idea in comparison with the competing phone. Combined with other factors, you'll be in a good position to decide whether or not to buy a particular phone.

When you're buying online, you obviously have the Internet to help. You can use this to your advantage by researching the processor on your phone of choice. What you need to look for is what generation the processor belongs to. Ideally, you want to go for a phone that has the newest processor available in a particular price bracket. If not, you can go for a generation older, if the price justifies it. For example, a Snapdragon 200 would make sense on a phone that costs ₹4,000, but not on one that costs ₹7,000.

As a rule of thumb, your phone should at least have a quad-core processor, since most dual-core processors are outdated nowadays. Apple's dual-core processors are of course acceptable, while Intel's hyperthreaded dual-core processors are also fine. Apart from that, you should avoid other dual-cores.

RAM

The multitasking capabilities of a phone are further dependent on the amount of RAM it has. The more RAM your prospective phone has, the better it is. Of course, that doesn't mean you should just run after the device with the most RAM. Think about what you do on your smartphone, do you play a lot of



games on it, or do you just use a few simple apps and restrict your usage to calling?

The former would mean you need as much RAM as you can get, while the latter would mean that 1GB of RAM should be enough for you. A powerful processor doesn't automatically mean good perfor-

mance, unless your phone has enough RAM to feed it.

Operating System

Perhaps the most important part of future proofing your smartphone is through the OS, especially on Android phones. Ideally, you should buy a phone that runs on the latest version of Android, if not, the version just before the current one is also fine. This is especially important for phones that come with their own UIs, since OEMs often slack off on updates when they have their own UIs. You should also ensure that the company you're buying the phone from has a good track record for providing updates on time. Motorola for example, is without a doubt the best at this, while Samsung is good with updates for its high-end devices but neglects mid-end to low-end devices unless they were newly released.

You can also make a choice based on operating systems. If you like using a lot of different apps, then you're definitely going for Android or iOS. On the other hand, if you're a basic user, then Windows



is a very good looking and quite a capable operating system.

UI

With saturation on the hardware side, almost every company is going for its own UI nowadays, in order to achieve product

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HOW WE TEST SMARTPHONES

Now that you've finally bought the smartphone that you wanted, you can take more time to test it out. The first and foremost thing to do is to establish the testing conditions. There have to be constants, so that each phone that you test can be compared to others. For cameras, you must use the same subjects and conditions, while performance must be gauged based on precise and identical tests between phones. Here's how we do it.

Display: For our tests, we first turn the display up to full brightness. The brightness levels may differ, but it ensures that each phone is as bright as it can be for the tests.

We start with the simple tests, similar to what you read hear for testing in a retail store. The difference is that the phone is always kept under the same light and at the exact location, so that the surrounding conditions are also exactly the same for each phone. We check for colour shifts and gauge the viewing angles, which gives us a good idea of what we're working with.



Next, we take the phone into a completely dark room and open various images on the display, examining the colours and brightness. This is not a real world test, but one that gives us a good idea of what the display is capable of without any outside interference.

For a more objective look, we use the lagom.nl tests on the browser to get an even better idea of the display. This is then followed by apps like AnTuTu, which offer a display test of their own. This really gives you an idea of the capacity of a display. This is done in a more real world settings, but in an area where the light is always the same.

Lastly, we take the best performing smartphones from the price segment that the phone belongs to and examine the display next to these phones. We use the same images on all the phones and examine the difference.

In some cases, like in Super AMOLED and AMOLED displays, there's a visible yellow-ish tinge on the screen, which is visible irrespective of what the light conditions may be.

Lastly, we take the display out in the sunlight and examine the visibility outdoors. This step is very important.

Performance

Processor: As mentioned before, the processor is one of the most important aspects of a smartphone, so we spend the most amount of time testing it.

While most use benchmarks alone, here at Digit, we believe the real world performance is not reflected by benchmarks. Benchmarks are good for gaining an objective perspective on the performance and one that can be easily compared to other smartphones. To start with, we use the AnTuTu, Geekbench 3, PC Mark for Android and 3D Mark benchmarks to test the processor's performance. This is always done on a freshly set up device and each benchmark is run from a fresh reboot. In order to ensure that the scores you're getting are as accurate as possible, it is advisable to run each benchmark multiple times, and always from a fresh reboot.

You may be wondering why 3D Mark is being used as a processor test, well, it is not exactly used that way. The 3D Mark benchmark is a graphics test, but one that takes into account the entire system as a whole. Hence, it is a very good benchmark for testing SoCs on smartphones. The AnTuTu and Geekbench tests are the major indicators of the processor performance though.

The Geekbench 3 test gives you comparative scores for single core and multi-core performance. This can be directly translated to your apps, some of which require only one CPU core to be running, while others need multiple. So, a phone that shows good single core performance but only satisfactory multi-core performance, can be expected to slack off on more intensive applications and tasks.

The AnTuTu score breaks this down further, with scores for Integer and Floating Point performance. Of course, the Floating Point values are always lower than Integer values, but you wouldn't want them to be very low. Integers are easier to compute, which is why the values are higher.

The AnTuTu test also gives another very important number, which many overlook, but more on that later. The benchmark tests are run once again after the phone has been loaded with apps and used for a while. You will almost always notice a drop in the scores here, which is expected, but the drop shouldn't be very high. For example, a Moto Turbo shows about a 2% drop after it has been loaded with apps like any regular phone would be. It's a very good way to get an objective idea of the real world performance of the phone.

GPU: Have you seen mobile games today? They're becoming better by the day, especially with companies like Marvel and Warner Brothers taking interest. Our principle GPU test is GFX Bench, which is known for its GPU tests. In fact, the Manhattan tests on GFX Bench were added quite recently, in order to provide for the newer GPUs coming into the market nowadays. It's the perfect benchmark to use for GPU performance comparison.

While GFX Bench provides a lot of tests, the most important are the T-Rex and Manhattan tests, both onscreen and offscreen. On the onscreen tests, the benchmark simulates a gaming environment, taking into account the smartphone's display as well. The offscreen tests on the other hand are done without taking the display into account. Naturally, the scores for offscreen are always higher than onscreen. This is because 720p, 1080p or 2k displays are not easy on a processor.

Heat: A question we constantly get about almost every smartphone today is whether it heats up. Well, every phone does, especially if you live in the Indian summers. That said, some heating is fine, absurd or abnormal heating is not. The GFX Bench and 3D Mark tests come in very

handy for this. Since both of these are really tough on the processor and GPU, we run them in succession and examine how hot the processor is. There are apps like CPU-Z and CPU-Temperature that help us note the temperature before and after the tests.

Next, we play a game (that remains constant for all phones) on the phone, for 15 minutes. You can choose how long you play for, but 15 minutes is generally the time taken for even the best processors to heat up and throttle themselves. The temperature is noted before and after this. We consider 45-50 degrees to be acceptable, while anything above that is worrisome.

While doing all this, you must remember to keep the temperature conditions in your room the same for all smartphones that you are testing. If the air conditioner is at 26 degrees, then it must be so whenever you're testing a smartphone.

Storage: Remember the part of the AnTuTu test we said we would talk about later? This is it. Most smartphone reviews talk about how



much storage and phone has and whether an SD card slot is provided or not, but that should never be the end of it.

Android users especially should care about this, since the OS has dismal SD card support to say the least. The flash storage on your phone is essentially an SD card that the OEM fits into the device while building it. Since you, the user, won't be able to reach it, this is also an area where many smartphone makers can cut costs.

The AnTuTu benchmark provides a number for the I/O performance on your smartphone's storage. This is important to figure out what kind of storage you have. Higher the number, better it is.

The inbuilt flash storage is where all of your apps will reside and it can have major effects on your phones overall performance. In fact, you'll notice sometimes phones with good benchmark scores still tend to stutter in performance. This can be because of poor quality of flash storage inside.

Camera: For the camera, there are four basic light conditions that we test in – sunlight, yellow light, indoor fluorescent lights and low light. The first three are pretty easy to achieve, we just have the same subject set up in the light conditions mentioned above. Low light is a little more difficult, simply because it is harder to achieve the same amount of light for all shots. We do this by ensuring that our subjects are kept at a fixed point, where we can control the lights ourselves. None of the subjects used for our camera tests are ever moved.

We also use a colour chart, which gives us a very good idea of how a smartphone's camera performs with various colours. The colours range from the deep blacks to the bright yellows, reds and more. This colour chart is also fixed at one point, where the light conditions can never be changed.

All our camera tests are done on the auto mode, without using any of the smartphone's added camera tweaks. This is because smartphone cameras are meant to be point and shoot cameras, meant for everyday users. If a camera can do well on the auto mode, then it can do so on the other modes as well. We of course test the other modes out as well, but we do that separately, during regular usage.

If a smartphone is too dependent on its camera tweaks, then that in itself is a weakness, since the user may or may not be able to understand said tweaks.

Battery: As mentioned before, a bigger battery doesn't necessarily ensure better battery life. A 2600 mAh battery won't last as long on a 1080p display as it would on a 720p display. It may also differ based on the display size, processor used and other features of the device. So, it is very important to keep a uniform battery test, which will be the same for all devices, irrespective of their specifications. This ensures that all devices are put through the exact same amount of load when testing the battery.

For our in-house tests, we run a 1080p video (same for all phones) with WiFi and all background activity on and the display on full brightness. We run the video for exactly one hour and note the drop in the battery having started the test at 100%. It is important to start all tests at 100%, as the percentage drops reduce when you go down the ladder.

Since modern SoCs are optimized for video, we also use the Geekbench 3 and PC Mark for Android battery tests in order to get an objective view of the battery life.

Call Quality: It is still a phone after all, so a review can not be complete without ensuring proper call quality. For this we check for crackling or any other noise during calls. This is a two way street, meaning things have to be clear on both sides. We also examine the in-call volume, with and without the loudspeaker.

Real World Usage

While all of the above sounds very good, none of that would make sense without real world usage. Our battery tests would simply be numbers, worth nothing, if we couldn't transform them into real world figures. If a phone has 4GB RAM, then we run multiple games on it one after the other and put it through as much intensive usage as we can to see if it can take it. If the Galaxy S6 Edge scores over 60k on AnTuTu, then we put it through a lot of intensive tasks to see how long it takes for the processor to throttle down enough for that rating to drop.

In addition, we use each smartphone as our own primary device, doing our routine day to day activities to check for glitches and issues. We may use the benchmarks for testing, but they are useless if you don't know what they would translate to in real life, which is what we do through real life usage. We test out each and every benchmark number for what we expect it to translate to and don't sit down to write a review before we're convinced that the numbers are accurate. If they are not, then we try to represent the real world usage using benchmarks. All this is done to ensure that neither human, nor machine is making any errors and the resulting review is as accurate as possible.

HOW YOU TEST IN A RETAIL STORE

In a retail store, you have more freedom to choose and check out the device you're buying. Try the following things to select the right smartphone for yourself.



1 Display: The best and easiest way to figure this out is with a working phone in your hand. Look at the display from various angles. Do this by turning the device in various directions. Next, keep the device stationary and if you can, then play a video on it. Now move around and look at it from different angles again. If you see a color shift on the display, then it's a problem. Note where you see the colour shift from, is this something that'll be prevalent in real life situations? If yes, then the display isn't good.

While you're tapping on apps and trying the phone, notice if the display is getting smudged. If it does, it will not stand the test of time.

Like laptops, a very good way to gauge a phone's display quality is by opening lagom.nl on the browser and taking their LCD test.

You should also notice the touch experience on the display. A Gorilla Glass protected



display feels very smooth, while lower quality displays will feel sticky and the touch experience will be bad. Try using multiple finger touches in order to figure out whether the display is responsive enough.

2 Build: No, don't try to bend the smartphone. Rather, take a very close look at each hinge. If you can see the screws, are any of them loose? Can you hear creaking on the device?

If the back is made out of plastic, then what kind of material is it? When you're holding the device, is the back getting smudged by fingerprints?

With a plastic back that's openable, you can get a feel of the quality of the plastic as well, simply by bending the rear cover. Hard plastic is better for any smartphone.

Take a look at the SIM slot too, many phones have defects there, especially for those which have SIM trays built into them. Try taking the SIM tray out and putting it back in, see if it's getting stuck anywhere.



3 Performance: Mostly, you won't have an active internet connection in a retail store, so an easier option is to open apps and fiddle around with the device. See how long apps are taking to open, demo device put in the store should ideally not show any lags in this case. Use the phone for a while without closing any apps that you open, see if any lags tend to creep in.

A good test to try out in the retail store is to turn on the camera and put it on the video mode. Shoot a video for a few minutes and notice if the phone is heating up. A little heat is expected, but if it gets hot fast, it's not a good sign, especially if the store is air conditioned. Heating throttles the processor and will hence hamper performance. It can also affect the processor's life in the long run.

If you have the time and can set up a hotspot to connect to the Internet in the store, then you can even try running some fast browser benchmarks, like SunSpider. Put the phone through whatever tasks you can think of and see if it can take it.

4 Camera: This one's tricky, but you can still get an easy taste of the camera in the store. Remember, looking at an image taken on the phone's own display is not



the right way to gauge the quality. Ideally you should always have a calibrated display where you can look at the picture on. In the store though, you can do two things.

First, you should be quite familiar with your own phone's display, so click a picture with the phone you're buying (preferably one with a lot of details and colours) and transfer it via Bluetooth to your own phone. Then see how you like the picture.

Second, take the same picture using your own phone and with the phone you're planning to buy. Transfer both the images to any one device, preferably your own phone, since you're familiar with the display. See what differences there are. You will most likely not be able to gauge the white

Battery Test

03:11:50

Battery Runtime

1918

Battery Score

balance or colour reproduction, but you will get a good feel of whether you like the camera.

5 Battery: Request the in-store personnel to take the phone off charge, then check what percentage the battery is at. Now shoot a video at the highest resolution that the phone is capable of for five minutes and check the battery drop. In a high-end phone, the battery drop shouldn't be more than 2 percent, while sub-10k phones can drop up to about 5 percent, anything beyond this is not quite acceptable.

differentiation. The information that most people would and should seek is about bloatware, because pre-loaded and useless apps will reduce your phone's overall performance because bloatware run in the background and consume precious resources. Bloatware is a nuisance and some manufacturers plague their phones with them. Which is why many people either root their device or select something that offers a pure vanilla UI experience like Google's Nexus range.

Storage

Despite all of the above, your phone can never really be future proof unless you have storage options. While 16GB with SD card is considered to be the minimum, in reality, you should be looking at 32GB with or without the added SD card support. If you do not have any music or videos on your phone, 16GB with SD card may still be enough for you, but why take the risk right?

Over time, your smartphone will have a lot of data saved from different apps, which means storage is an important aspect of future proofing your device.




Battery

As you may already know that the bigger the battery, the better it is for you. Although a bigger battery doesn't automatically mean better battery life, it is still a good thing to have. Reviews are the only

way to find out about this before buying a phone. Since you can know whether that big battery in your device of choice actually translates to an improvement in real-time battery life of that particular device.

Camera

This is another area where reviews are the most helpful. Camera quality isn't determined by the megapixel count and so, you shouldn't fall prey to the entire myth about more the megapixels, the better the camera. What you could find out though is what kind of sensor your phone of choice is using. Sony and Samsung sensors are prevalent, but Sony's EXMOR RS sensors are arguably considered the best and you'll find them in most flagship devices available nowadays. Smartphone cameras these days also come with 4K recording capability and so, you can buy the ones that offer 4K recording if you so desire. If most of your camera usage will be to snap selfies, make sure that the phone you're going for has a good front facing camera with a decent sensor. 



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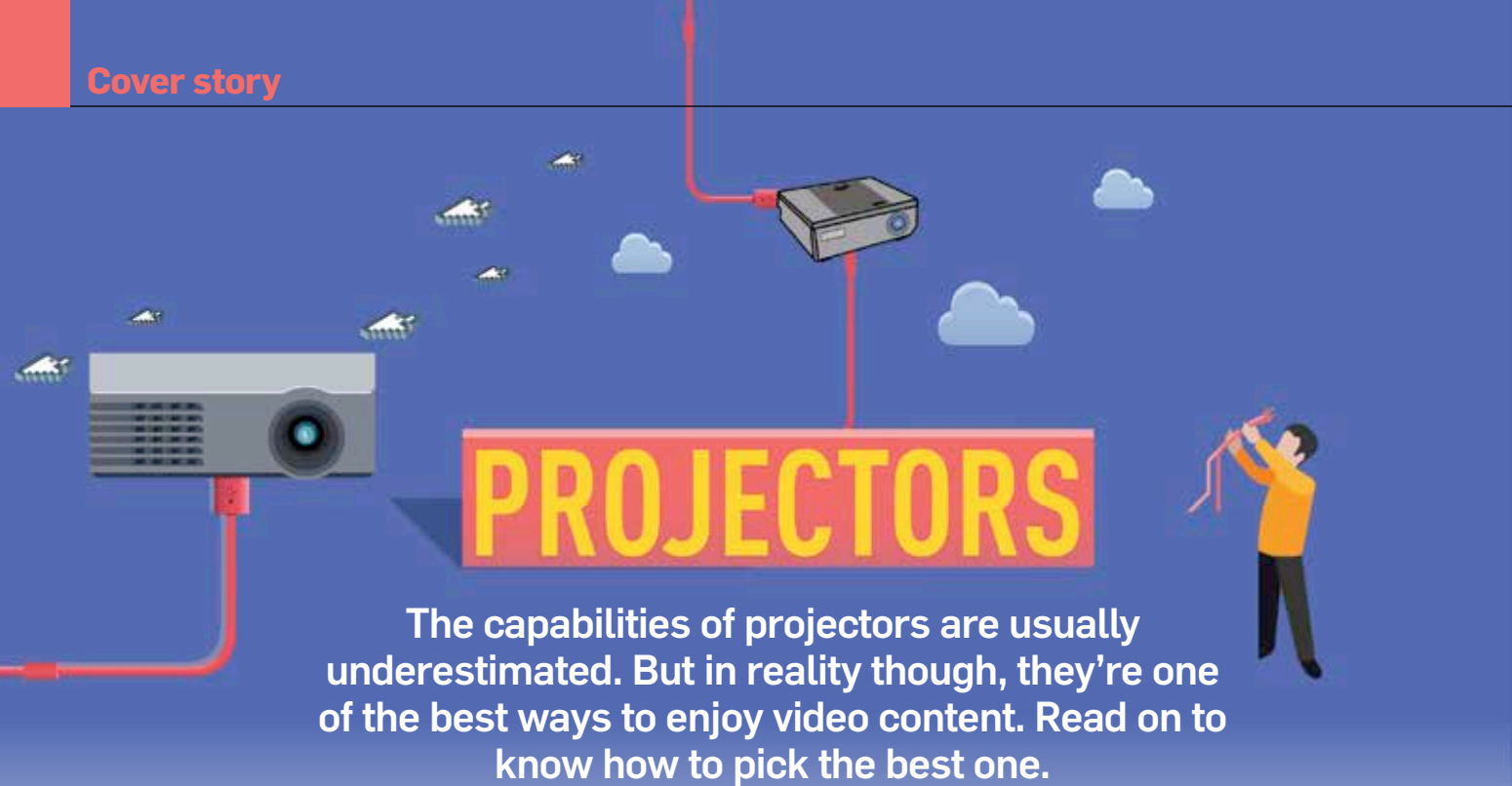
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The capabilities of projectors are usually underestimated. But in reality though, they're one of the best ways to enjoy video content. Read on to know how to pick the best one.

By **Jayesh Shinde**

We seldom think of projectors as the centrepiece of our home entertainment system, always desiring to invest in a big screen HDTV instead. Perhaps the deep-seated notion that projectors are expensive and mostly for commercial use is an added deterrent. It's only something you witness inside a cinema hall on a weekend, most people believe it's out of their reach.

Just drive that notion out of your head. Granted that having a projector setup in a household isn't the same as installing a



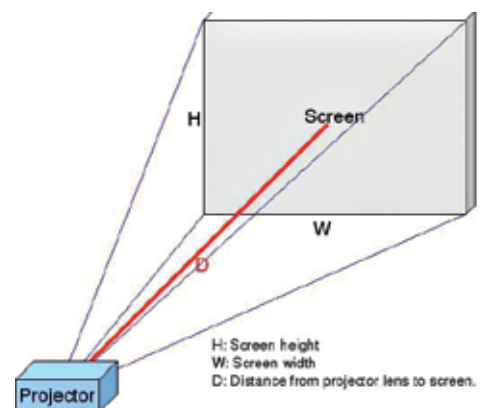
large screen high-definition LCD TV, there are some clear advantages the former enjoys over the latter. With a projector, any room can be a movie room – be it the living room or guest room, wall or ceiling – and the resulting image it throws can be bigger, better and larger than your HDTV. Most HDTVs measuring over 40 inches are priced between ₹50,000 to ₹1,00,000

– so are most good home entertainment projectors. But when you're considering to purchase a home entertainment projector, pay attention to the following things:

1 Brightness and Contrast: While buying a projector, brightness of picture is a top priority. We know that you may not be able to test this out yourself, but nothing stops you from visiting electronic stores and trying out projectors. In our experience, we've found 3LCD projectors to be slightly better and brighter than conventional DLP ones. But the margin is very fine. Thumb rule is to buy a brighter projector if you aren't guaranteed a fully dark, theatre-like room at home for your movie-watching sessions.

While you should always consider buying a projector with a high native contrast ratio, most projectors tout dynamic contrast ratios (taking into account technologies and features that add on to the native contrast ratio) which are very difficult to ascertain by you. It happens in real-time where the projector adjusts the light output at any given frame of image. But always remember that projectors with a high dynamic contrast ratio may not perform as well as a projector with a high native contrast ratio.

2 Throw Distance: This matters a lot in urban homes that have space constraints. Consider buying a short throw or ultra short throw projector if you don't have large rooms, or don't want the distance between the projector and the screen to be more than a metre, so it doesn't block space unnecessarily. Ultra short throw projectors are capable of sitting a few inches from a wall or screen and project between a 40 to 60-inch image without a hitch, from what we've seen.



3 Resolution: We can't stress enough on this aspect. If you are considering purchasing a home entertainment projector – for watching Blu-ray or 1080p

HOW TO TEST MORE

Apart from retail testing, here we highlight a few slightly more difficult, cumbersome, and technical tests that we conduct on projectors. If you have the means and access to conduct these tests inside an electronics store, by all means go ahead.

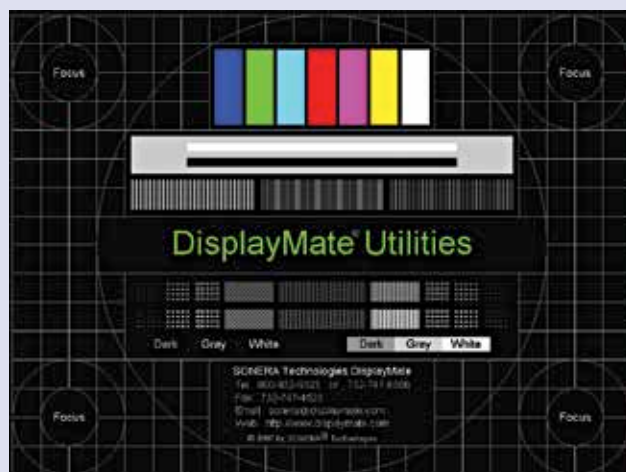
- **Light meter** - More precise than an app loaded inside a smartphone, using a dedicated light meter (like the ones used by professional photographers) to sense ambient light falling directly



on it is one of the best way to gauge the brightness of a projector. We use the Konica Minolta light meter (as pictured alongside) to check the exact illuminance and luminosity level of the light (measured in lux, the official unit of luminance) coming out of the projector. We usually take the light reading at the screen, while keeping the

white bulb of the light meter pointed directly at the projector lens, bathed in its light. We take readings at the center of the projected image and all the four corners and average the total.

- **DisplayMate** - We use this software to not only diagnose and optimise but also test and evaluate the projector's display quality



through a series of industry recognized, widely trusted tests. Lagom.nl (www.lagom.nl) tries to capture just a fraction of the strenuous tests that DisplayMate tries to subject your projector with. Apart from checking brightness, contrast, and red, blue and green colour intensities, DisplayMate lets you test a whole host of grayscale and colour gradient tests – vertical line resolution, horizontal line resolution, colour pyramid, screen tearing, jitter, flashing etc. It's as exhaustive a test as you can put your projector through, trust us. It gets the job done spectacularly well.


flicks, or HD gaming on a console or PC – it should have a Full-HD resolution. End of discussion. Pumping in a full-HD movie from your laptop / media device and watching it squeezed down to fit into a 1280x800 or 1280x720 projector screen is nothing short of blasphemy. Say no to black bars!



projector you're thinking of buying. Trust us when we say that a good audio setup goes a long way in improving your content watching experience by leaps and bounds.

4 Audio: Most, if not all, self-respecting home entertainment projectors will come with onboard speakers. But these speakers are great as a contingency option, don't look at them as the primary audio outlet to your movie-watching needs. Try as hard as they may, onboard projector speakers are just not that good – they're alright if you want

to watch a news broadcast. It's the same as expecting laptops to have great audio output – they just don't, despite however hard they try. They can never compete with a good 2.1 speaker set or a proper 5.1 audio setup. So do yourself and your ears a favour and invest in a good pair of speakers (at the very least) to go along with that spiffy new home entertainment

5 3D: 3D is slowly coming of age not only in cinema halls and TVs but also in projectors. We'd still advise that you don't buy a projector solely based on its 3D capabilities, because eye fatigue can still kick in, no matter what. However, when you purchase a 3D-capable projector, ensure you invest in the requisite 3D glasses – active shutter or passive ones, whichever are applicable in your case – and not the cheapest ones available. Your eyesight is at stake after all, so please choose wisely. 

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HOW YOU TEST IN A RETAIL STORE

While it's difficult to test a projector fully at a retail store, here are a few things that you can try to discern from a projector sample in a store. Let's see how:



1 Brightness: Test the projector's brightness with a light meter app like Lux Meter (<https://goo.gl/x3U52l>) or Easy Light Meter (<https://goo.gl/85W3Kj>), which should give you a decent idea about the projector's brightness output.



4 Audio: Carry some of your favourite songs on a pendrive and try to play them off the projector that can play audio content off a pendrive. If a projector audio performs worse than a laptop's speaker, time to give that sample a skip.



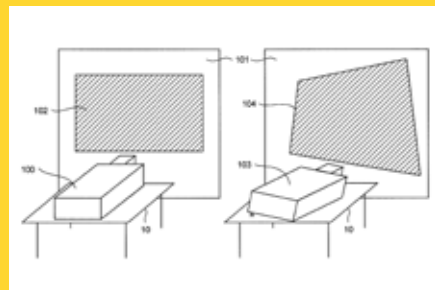
7 Connectivity: If wireless access to projectors is a big requirement, ensure you connect your laptop or smartphone wirelessly with the projector and try playing content through it. Also, make sure the audio ports are compatible with your stereo setup.



2 Videos: Load a few HQ 1080p videos onto a pendrive and try to convince the sales assistant to let you watch them, as they're crucial to let you decide whether you'll buy the device or not. Check for Rainbow or Moire on your videos.



5 Menu buttons: Whether you keep your projector on a desk or hang it upside down, menu buttons are essential to get the job done, so make sure your projector doesn't skimp on this tiny little detail for your own future peace of mind.



8 Keystone: If your prospective projector comes with an auto keystone adjustment feature, try lifting the projector from the front (and changing its projection angle) and see if the keystone corrects itself in a few seconds. It really helps.



3 Rainbow, Moire Effect: These are visual aberrations in the projection. To see if a projector suffers from Moire effect, project a still white frame onto the screen. Rainbow effect is usually manifested while displaying a high frame rate action sequence and you see a hint of blue-red pattern at object edges.



6 Screen: A screen with a white foreground and a black background is recommended. It's also better to get a sheet suspended off a hook that can be folded later (priced around ₹1,500 for a 6-feet by 4-feet area) as compared to much costlier options depending on your budget would be good enough.



9 Temperature: Take a digital temperature thermometer along and ensure the test projector has been playing nonstop for at least 15-20 minutes before thrusting your thermometer's probe into the projector's heat vents. Let the temperature reading stabilize. Under or around 60°C - good. Beyond 75°C - bad.



GRAPHICS CARDS

GPUs have been like precious fuel since they've let us play games in all their glory and they continue to do so. Learn how we push 'em pixel crunchers to their absolute limit when we test them.

By **Mithun Mohandas**

Very few PC components are as exciting as graphics cards to tinker with, after all you do get to play an awful lot of games under the pretext of "testing". However, graphics cards have come a long way since the early days when hardware roles were more discrete. These days we have CPUs and GPUs which have adopted functions which are just shy of being truly homogenous. We'll debate on this later, for now, let's get you started with benchmarking these pixel-crunching wonders.

Types

For starters, graphics cards are bifurcated into two groups because the computational workload performed for these tasks are vastly different. Moreover, the number of users who perform both of these tasks are quite minimal. This is why, having a one-chip solution that caters to both usage scenarios wouldn't bode well since most of the users will end up paying for something that they're never going to use. So which are these two distinct groups? Well, the overbearing majority happens to be us gamers and the minority (with deep pockets) are the ones that dabble in graphics content creation.

There is a third class which we haven't spoken about and will not be covering for obvious reasons – the supercomputer chips (for those with endlessly deep pockets).

Gaming

These are the cards that most of us have heard of. There are two competitors as far as discrete cards are concerned – AMD and NVIDIA. Intel has a pretty decent graphics solution which is integrated into a good number of CPUs in their lineup but they come nowhere to the capabilities of these discrete cards. Gaming cards are tasked with pushing as many FPS

(Frames Per Second) in games as they can. The more expensive the card is, the more FPS you are going to get. And as the years pass, these high-priced cards retain the capability to render whatever the current game engines can throw at them while the more economically priced cards stutter at the mere mention of a AAA title. Implementing proprietary APIs is another thing that these cards do and each competitor has a good bunch of 'em which work wonderfully on their offerings while rendering the cards from the competition lethargic. NVIDIA's lineup goes by the GeForce moniker while AMD uses the Radeon label.



Workstation

Quadro and FirePro are, respectively, the brands that NVIDIA and AMD have in this space. The most prominent difference between gaming graphics cards and workstation cards is that workstation cards focus on OpenGL libraries while gaming cards have a lot more on their plate with DirectX, Mantle, Vulkan etc. Workstation machines also work on textures which are of much higher resolution than what you see in video games. This means they have a lot more RAM to handle humongous calculations so that the data need not be sent to the system RAM. Just to put things into perspective, dual-display setups are commonplace with each monitor rendering frames at 8K resolution. Whatever you enjoy on your gaming card was actually made on a workstation card and given their capabilities, these cards cost a bomb. Another key difference is that, these cards can crunch a lot more double-precision Floating Point (FP) numbers while their gaming counterparts focus on single-precision FP numbers.

What do the numbers mean?

Fortunately, testing graphics cards is simple when you are looking at benchmark scores. Understanding the core architecture can be an uphill task since it does require a fair bit of understanding of the underlying technologies that are used in microprocessors. So what kind of numbers are you going to be looking at?

FPS

Frame-per-second is the prime metric that you'll be looking at when it comes to games. There are a few thresholds that you should keep in mind. 24FPS is what your eyes can perceive without any problems but 30FPS is preferred over 24 since minor stuttering that occur during intensive scenes go unnoticed if your average FPS scores are at 30. 60FPS is the holy grail that most gamers aspire towards since in all likelihood if your average score is 60FPS then the most intensive scenes will probably be above 24FPS. Anything that goes lower is going to seem stressful with lower numbers being really painful to watch. These days we have monitors that synchronise with the graphics cards to lessen the effects of vastly varying frame rates.

HOW TO TEST MORE

We use a good number of games as well as synthetic benchmark suites to generate scores and some of the software used are quite expensive for an individual to buy for a one-off test. So before we get into the different benchmarks that are available, we need to establish a few ground rules. You can call them common benchmark practices. Firstly, you need to ensure that no new software are installed between benchmarking two different graphics cards. Each new software added might have a background process which will eat up a few CPU cycles bringing about a small difference in scores. It could be negligible in most cases but we don't take any chances. The same goes for drivers, so ensure the same set is used for all cards you test but there will be instances where upgrading the driver is necessary since certain drivers bring noticeable improvements in scores. To compare your scores with other cards, you need to pick a popular website like www.digit.in (*wink wink*) and compare the score obtained in a particular game and run the same at your end. There will be a difference if your PC configuration is different than what the site uses and you can use this score to add or subtract a percentage to normalise scores. There can be a variation in scores if you are using a different version of the game or benchmark, so normalisation is something you will have to do.

Matching temperature scores is very difficult since the variable parameters are too darn many. We only look towards maintaining the ambient temperature and you should do the same too. A variation of a few degrees between the site's reading and yours is fine but anything in double digits is reason enough for investigation.

There is an entire bunch of parameters that go into scoring the build of the card. Some of which include the different materials that go into the chassis construction, the cooling mechanism, the choice of material, the placement of components on the circuit board, the accessibility of switches if present, the slight droop of the card when slotted sideways, the efficacy of unique features etc.

The benchmarks are chosen with an even distribution of proprietary APIs so that one competitor doesn't end up getting better scores than the other. Each benchmark is run multiple times over to get an average score. This eliminates any instances where the score might have dropped owing to background processes of the operating system that we have no control over.

And lastly, each routine of benchmarks are run at different resolutions under two different states. Once when the graphics card is set to factory clock speeds and once when it has been overclocked. You don't need to run the entire gamut of our benchmarks, only the ones that you are bothered with. Otherwise, you are looking at a few weeks worth of benchmarking.


Watts

If you are worried about long term cost overheads of investing in a powerful card then this metric is what you should be concerned with. There are plenty of bundled software that record wattage levels over time. So you can estimate as to how much more are you going to have to pay in terms of electricity consumption.

Temperature

Graphics cards get hot, really hot, so temperature is still a factor, but one that will soon be of less relevance owing to improvements in chipset architecture. The problem with heat is that it lessens the lifespan of your graphics card as well as the components around it if not taken care of.

Synthetic scores

Given the ever increasing number of video card benchmarks coming out nowadays, you'd assume that you have a lot more numbers to worry about. Well, not exactly. Some of these benchmarks take a look at the frame rates recorded during runs while some look at the number of times a certain type of calculation (related to rendering a frame) can be repeated within a given time frame. At the end, a lot of benchmarks run multiple types of tests and the score obtained is unique to that benchmark only. This is why, you always need to compare two graphics cards' benchmark scores for the same benchmark which was run at exactly the same settings. This makes scores highly contextual. 



STORAGE MEDIA

They come in different shapes and different sizes

By **Mithun Mohandas**

We can never have enough of storage and our storage woes worsen with each passing year. There are vast improvements on the horizon in this segment with more manufacturers releasing PCIe based SSDs for the new M.2 standard. Moreover, NVMe has just been released and consumer models have started arriving. In light of these new technologies coming into the storage sector, the days of storage being the bottleneck in computers are soon to end. This clutter of new technologies also means that the user has more things to choose from while building a new computer, so here's how you'd go about testing these new storage devices.

Types

There are quite a few verticals by which you'd classify different storage products. There are SD cards, thumb drives, hard drives, SSDs, PCIe drives, M.2 drives and then there are devices which use some of the above drives to create storage devices with better data security/capacity/features. A NAS (Network Attached Storage) is one such device. Then you have to look at the interfaces through which these drives are connected to the computer. There is a plethora of options on this end as well. But we aren't going to worry about all of that, instead we're going to narrow down all of the above into categories that the

average consumer would be most interested in buying – thumb drives, SD cards, hard drives, SSDs and NAS devices.

Thumb Drives

Call 'em what you will, thumb drives, flash drives, pen drives or those little thingys that you stick into your computer and take data. Thumb drives are damn cheap and the number of SKUs available in the market outnumber the different types of sarees you'd find in a wedding store. Which means you do have the choice between going in for a lot of storage+poor transfer speed or less storage+great transfer speed or you can pay a lot and get the best of both worlds.

SD Cards

DSLR camera owners will be most interested in knowing if that Class 10 card is

really worth the money. After all, the class 10 certification only means that the minimum transfer speed will be 10MB/s but the upper ceiling can be anything. So shooting images in burst mode or shooting high quality video with less compression will require a good transfer speed.

Hard Drives

These are the traditional rotary hard drives which are still in high demand due to the low cost/GB ratio. This makes hard drives the staple primary storage in almost everything computer that is released. There are hybrid SSHDs which offer better performance but the cost/GB ratio is a teeny bit hit for mass adoption. Laptops with a really slim profile have made the switch from mechanical hard drives to SSDs.

SSDs

SSDs are way better than hard drives in terms of durability and speed but the current generation isn't long lasting if you are a heavy user. NAND chips only have a limited number of read/write cycles, a drawback that mechanical hard drives are free from.

NAS Devices

The benefits of a NAS are many, you get a lot of storage space, data protection, transfer speeds and reduced power consumption amongst others. You



An SSD is a must-have nowadays

can choose to put SSDs or hard drives inside your NAS. SSDs help with data caching while mechanical hard drives in RAID configuration will provide good transfer speeds.

What do the numbers mean?

Just like graphics cards, even storage benchmarks are an easy thing to go through. You'll never be able to benchmark storage media before buying them but the marketing material on the packaging should give you some idea of what you're going in for. Let's clear those for you.

Throughput

The storage media's absolute maximum data read/write speeds is what throughput tells you. A lot depends on the type of NAND and the controller if we're looking at storage media that uses flash memory. This is why some USB 3.0 drives outperform others by a wide margin though both are of the same capacity.

IOPS

IOPS has been a standard metric for storage devices since their existence. It stands for input/output operations per second. Every time the computer tries to access a sliver of data from the storage device, one read/output operation is performed. The same goes for whenever the computer tries to store data on the media. The input/output operations use data of different sizes which is why throughput isn't preferred and IOPS makes a better case. Depending on the size of each operation you can calculate the throughput using simple multiplication, $\text{Throughput} = \text{IOPS} \times \text{size}$. If your values are off then probably the operation involves data of different sizes or you've hit a bottleneck somewhere.

HOW TO TEST MORE

In order to maximise the capabilities of storage media, you need to run these tests from devices that run much faster, which is why we have SSDs in RAID 0 for our storage media tests. Each drive is prepped for our test sequence which requires the entire drive to be in a RAW state for certain tests while for other tests, the media has to be initialised to accept data. The drive to be tested is connected to an interface port that is natively linked to the CPU rather than via a third party chipset. This reduces latency between the media and the CPU. Also, third party chips have been found to be not at par with native ports in terms of throughput.

We use a plethora of software, some of which run the same tests, to gather as many numbers as we can. These tests are also run over and over again to generate multiple readings which are then averaged for the final score. Not all storage media require the same type of data sets. For example, if benchmarking an SD card you wouldn't be looking at throughput registered with file sizes that are 1GB or more. It is likely that you'll be using the SD card in a camera which might take images that are 12-40MB in size. So these are the numbers you're interested in. A queue depth of 4-5 will tell you about the performance of the drive when you are taking burst shots with your DSLR. We use ATTO and CrystalDiskMark primarily for flash based media.

Hard drives and SSDs are more complex, they require different tests since they handle files of all sizes at varying queue depths. Benchmarks with smaller file sizes indicate performance related to the operating system, while larger file sizes indicate your day-to-day copy/delete operations. In such situations, a trace based tool is used. PC Mark's storage benchmark and IOMeter allow you to replicate these operations. Hard drive operations are monitored in different usage scenarios and those operations are replicated by these software to produce a much accurate representation of their real world performance.

Queue Depth

Queue depth is pretty self-explanatory. When you have multiple operations lined up after one another you get a queue of operations. The number of operations lined up translates to the depth of this transfer queue. Now in hard drives, queue depth can include read and write operations and with AHCI (most newer drives will be configured to use this) the drive intelligently sorts the queue so that the head (the actual component that does the job of read/write) doesn't have to travel far for the next operation. This optimisation helps with the transfer speed.


On SSDs, this is slightly different since there is no physical head, seek times are next to nothing and to actually saturate an SSD's throughput rate you have to have an

excessively high queue depth. Needless to say, we used the term excessive since your day-to-day operations will never achieve such high queue depth.

Real World transfer speeds

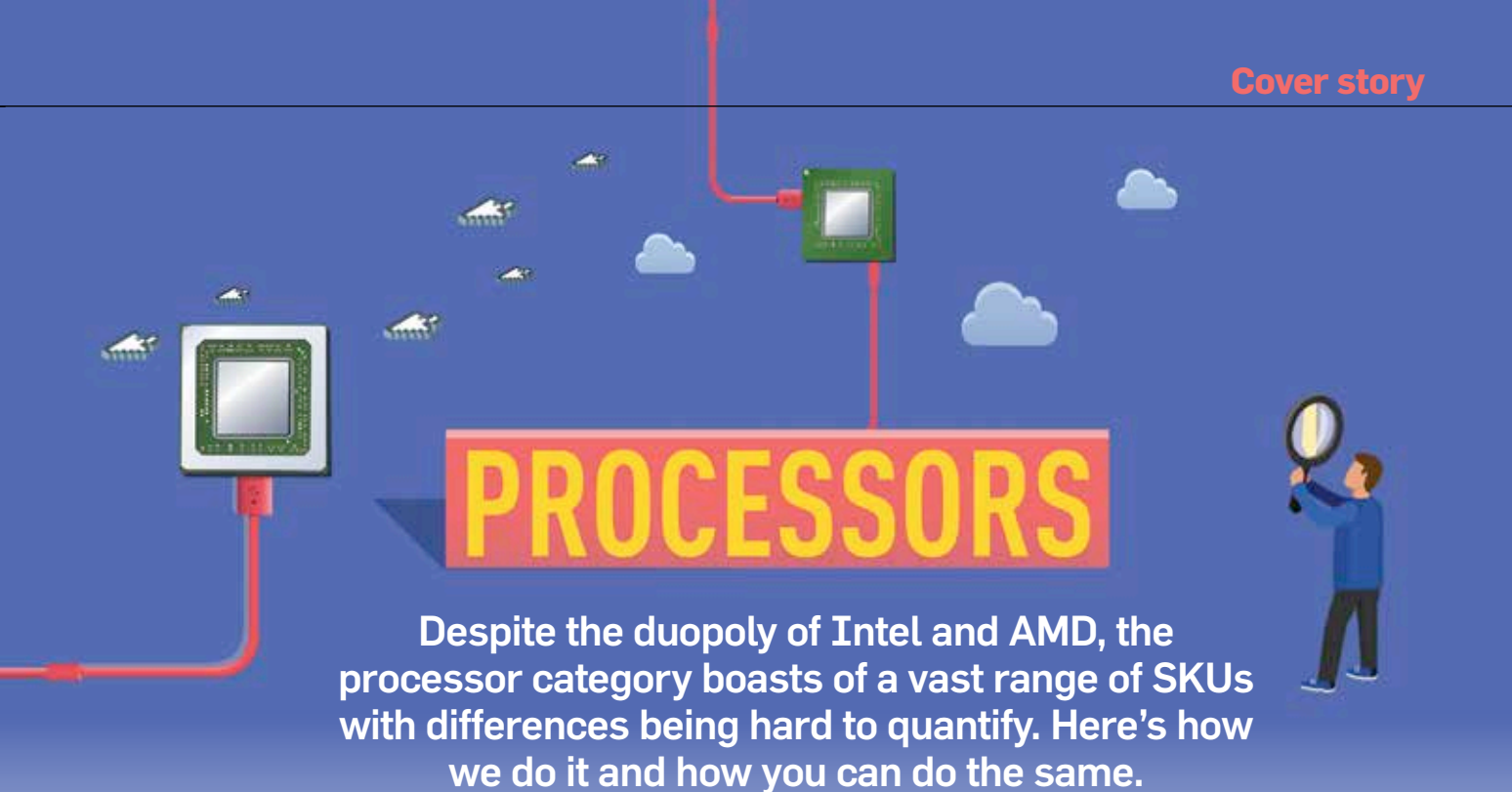
This is that one metric that you need to look out for. Synthetic tests will maximise throughput on most drives but real world tests will not. It shows you how efficiently a storage device performs at lower queue depths which are going to form the bulk of its operations. These tests are performed using files of different sizes and the data may be uniform or random.

Seek times

This is a metric that is becoming less relevant as SSDs become more affordable. Seek time refers to the time taken by the mechanical head to get from its resting point to where the data is actually stored. SSDs operate in a different manner altogether and don't suffer from latency issues. There are a lot of eco-powered drives on the market which reduce the power provided to the hard drive when not in use. This drastically increases seek times which is why such drives aren't recommended as your primary OS drive. 



M.2 SSDs are the answer to overcoming SATA III's 6 Gb/s bandwidth limit



Despite the duopoly of Intel and AMD, the processor category boasts of a vast range of SKUs with differences being hard to quantify. Here's how we do it and how you can do the same.

By **Mithun Mohandas**

The heart of a computer is one that is shrouded behind so many veils making it mysterious as well as confusing. And depending on what you are looking at, the characteristics that matter are different. Intel and AMD are the only two players in the market and both have an awful number of SKUs in the market and the nomenclature that both follow can be said to be works of modern art. That is, interpreting the model numbers require a fair amount of research and effort which puts it out of the league of most people.

Types

Depending on what kind of device it has to power, the processor takes on different roles. There are processors that also run the task of rendering graphics and there are specialised processors which are suited for low-powered implementations. There are server grade processors as well but that's something we won't be touching upon given that most of our readers are not into them.

Desktop Processors

The run of the mill processors from Intel and AMD boast of pretty well rounded capabilities. Both manufacturers have plenty of options when it comes to how

many cores you'd want. Each manufacturer has segregated their offerings across three buckets – Extreme, Mid-range and Low-end. Marketing terminologies vary but the overall picture is the same. You can spend as low as ₹2,500 or sell both your kidneys and get a processor that cost upwards of ₹74,000.

Unless it's an enthusiast processor, there is bound to be a graphics processor on the processor die itself. There are exceptions to this rule. Both Intel and AMD have pretty good on-chip graphics processors. Intel's HD Graphics improved greatly thanks to a patent sharing agreement with NVIDIA and AMD's acquisition of ATI helped it in a similar manner.

On a general note, Intel's processors use labels like i7, i5 and i3 apart from Pen-

tium and Celeron. AMD processors are sorted into two series – FX for enthusiasts and APUs for all segments.

Mobile Processors

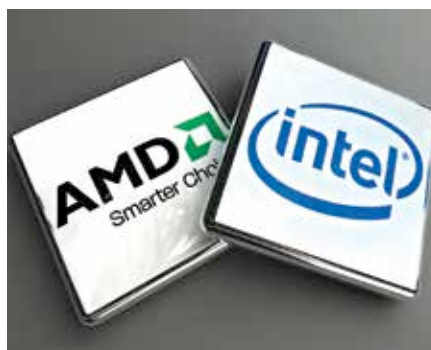
Laptops and even tablets these days incorporate processors which are toned down variants of what you'd find in your desktop PCs. This is necessitated due to the space constraints in these devices. Had these used desktop processors, then you'd pretty much be able to use your laptop as a computer-cum-electric-hot-plate.

SoCs

SoCs are what you tend to find in smart devices and of late, even Intel and AMD have forayed into a space that was dominated by ARM. SoCs used to be a few rungs below mobile processors but if we look at the past few years then they've hit a point of convergence where the two are nearly indistinguishable.

What do the numbers mean?

Processor benchmarks often give out scores that are a combination of multiple individual tests that have already been weighted and combined. These benchmarks are trace based, i.e. the work done by the processor under different scenarios



An age old battle between bitter rivals

is mapped and the ratio of different types are generated. These operations are then repeated over and over to benchmark the processor. These traces cover tasks like basic spreadsheet and word processors, digital content creation, playing video games and intensive operations like 3D model rendering. Sometimes benchmarks will provide a time score which is basically how long the test took to finish. Here are a few benchmarks that will help you rate your processor.

PCMark

It's an industry standard benchmark that runs multiple tests and you can even check entire configurations of users on their leaderboards. This way you can even check configurations which are the exact same as yours and optimise your settings if your ranking is found to be lesser. PCMark even breaks down their benchmark suite into large verticals which are general usage scenarios for computers.

Certain applications make use of a single CPU thread while others are optimised to make use of all threads. PCMark does provide scores for both these usage scenarios. Also, 3DMark can be used to judge game physics scores which are often handled by the CPU.

Cinebench

This benchmark has two tests, one is a render test which gauges the CPU performance and the other is an OpenGL animation test. Cinebench is a good way



A pretty comprehensive benchmark

to estimate how your computer would fare if you are going to tinker with 3D rendering.

Blenchmark

On the same lines of Cinebench we also have Blenchmark which basically involves running a Blender test file and checking how long it takes to render a particular scene. Moreover, you can then check the leaderboards to see how well it fares against a plethora of other processors. <http://dgit.in/BlenchMark>

HOW TO TEST MORE

Our benchmark for CPUs cover all the aspects that we've already touched upon in the previous section and a few other benchmarks. We do run PCMark 8's entire series of tests which not only includes the creative suite but also the application tests that covers some commonly found applications like a spreadsheet, word processor and also a few applications from Adobe's creative suite. Then for video encoding, we use handbrake (a video encoder) that makes use of some of the more proprietary technologies like Quick Sync that actually speeds up the encoding process.

We then run a few gaming benchmarks to gauge the processor's performance in games that are CPU intensive, like some of Total War's offering – Rome 2 and the more recent Atilla. APU's and CPUs that have an Integrated Graphics Processor are tested on a lot more games and in certain cases like AMD's APU's, some of which can run in CrossFireX with AMD GPUs are configured as such and the performance increment is measured.

For 3D modelling, we use 3DS Max and Blender using a test file and the time consumed for the benchmark to complete is noted.

File compression is also benchmarked using WinRAR's built-in benchmark feature.

And lastly, we overclock the CPUs on air cooling and run SuperPi to figure out the most stable frequency that the CPU can handle and then repeat the entire set of benchmarks.



SuperPi

SuperPi is less functional in terms of letting the user know what tasks the processor is good at. It is mostly used to test stability of a processor once overclocked.

How can you say which is better?

Naming conventions for both brands are quite elaborate so here are a few links to help you understand what they are and what they mean. <http://dgit.in/IntelSuffix> <http://dgit.in/CPUNaming>. What you need to note here is that, there are plenty of CPU whose model numbers are exactly the same except for the suffix at the end. And the performance difference between the two are worlds apart.


For example, take the 4th Generation i5 Mobile processor that goes by the model number Core i5-4200. There are four variants with different suffixes, one is an H, then there an M, a U and lastly a Y. The H comes with the highest graphics offering possible for that architecture, the M simply stands for a dual/quad core mobile processor, the U is a low-powered variant for Ultrabooks and the Y takes it a step further and reduces power consumption a lot more than the U.

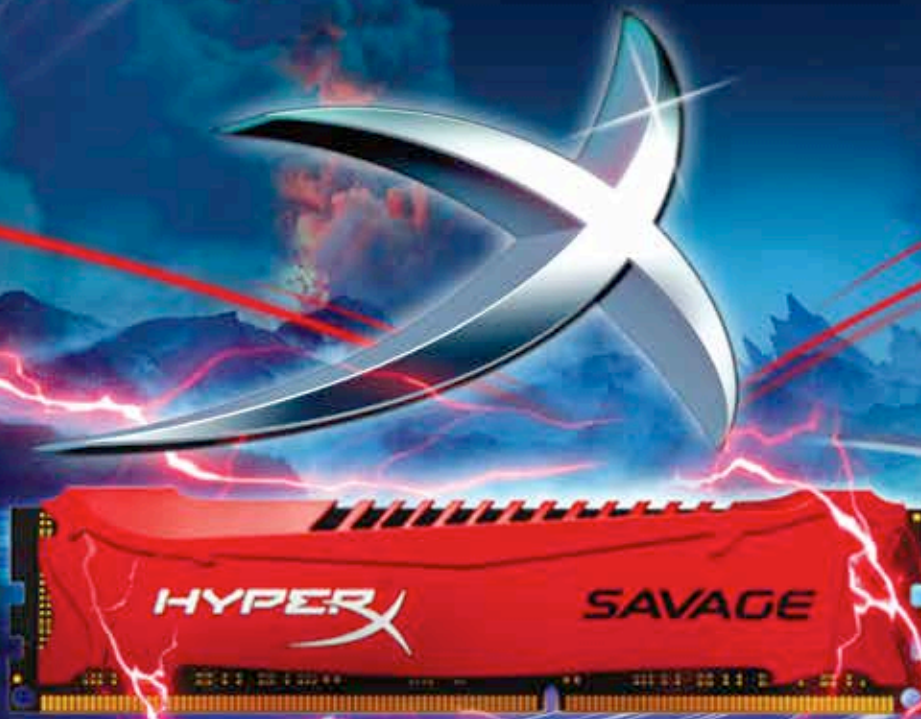
If you are surfing for a new laptop then you'll have noticed that most brick-and-mortar stores do not mention the entire model number and sometimes when they do so, the suffix is surreptitiously not mentioned. Just to put things into perspective, the individual rankings of these four pro-



Game physics are often handled by the CPU

cessors at the time of writing this article are as follows – 4200H: 394, 4200M: 440, 4200U: 594 and 4200Y: 819.

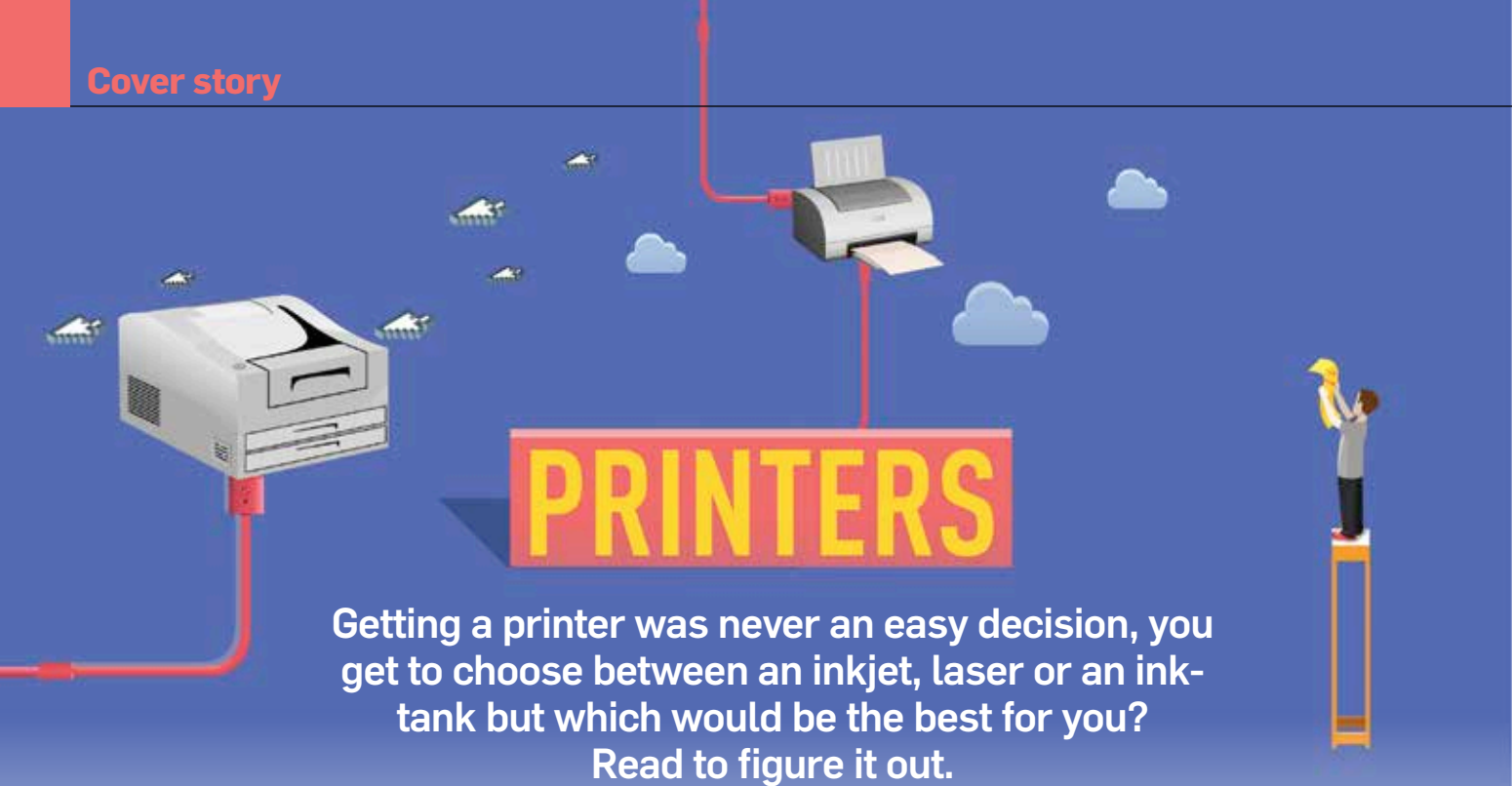
The more reliable (and obvious) method of telling which processor is better is by referring sites like passmark.com and notebookcheck.com which not only maintain leader boards but also display actual scores obtained. 



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Getting a printer was never an easy decision, you get to choose between an inkjet, laser or an ink-tank but which would be the best for you? Read to figure it out.

By **Anirudh Regidi**

As much as we'd like to believe that we're shifting to a paperless world, printers are still necessary and very relevant today. That said, this is one aspect of tech that you probably don't want to think too much about. Bearing that in mind, our test processes are designed to identify a printer that is eminently reliable, a great performer and non-intrusive. Here, we'll let you in on some of the secrets to behind the art of testing printers.

Types of printers

As far as we're concerned, there are only three prominent types of printers:

- 1. Inkjet printers:** These are the most common type of colour printers available today and can range from dirt cheap to exorbitantly expensive. The cheap printers are best for the occasional colour print-out at home, but usually run out of ink extremely fast and two sets of cartridges can cost as much or more than the printer itself. The more expensive photo printer variants of these will also cost an arm and a leg to run, but are the only printers capable of offering you high quality photo prints.
- 2. Laser printers:** These are as integral to a SOHO and other type of office as an office chair. A little more expensive

than a cheap inkjet for sure, but laser printers almost never jam and will reliably just keep churning out print-out after print-out without complaint and at an operating cost that's negligible. You get colour versions of laser printers as well, but the quality is only restricted to something you'd want from an office document or Powerpoint Presentation and definitely not something you'd want for photo prints.

- 3. Ink-tank printers:** Ink-tank technology is a relatively new entrant to the printer space and is taking the printing world by storm, if only for the ridiculously cheap colour prints that you can get from such printers. Think of these printers as quite literally using a pot of ink to print your documents.



Is print volume the only factor?

The prints thus acquired are usually prone to smudging and won't last too long, but they're dirt cheap, sometimes going to as little as ₹0.5 per page for a colour print.

Therefore, the choice of printer for you is as follows:

- The occasional print-out: Inkjet
- SOHO/high volume prints: Laser
- Medium-high volume colour prints: Ink-tank

DO

Now that you've settled on a printer, here's what you can DO to test these printers:

1. Inkjet printers

Since image quality is the priority here, you'll need to actually print an image and check the quality. You can use the image available at <http://dgit.in/1e8jxJX> to test, but it'll be best if you find an image that you're very familiar with and take a print of that.

You need to look for the following:

Colour accuracy: Compare the output print with the image on a calibrated display. You usually won't have a calibrated display handy but usually, your mobile phone's screen will be the best one on hand. If you have an iPhone or iPad, you're in luck as these devices have among the best displays available in the market.

Sharpness: Check the image for sharpness and detail. This will be particularly apparent in images with a lot of texture (cloth or a painted wall, dirt, sand, etc.) or foliage.

Banding: Smooth colour transition is a must for a colour printer and this is where the black to white transition strip in the test image mentioned earlier comes in. That strip needs to be perfectly smooth with no visible colour bands visible.

Tonal accuracy: This is a little harder to judge, but if you're using an image that showcases a colour tone that you're intimately familiar with (skin tones, the colour of your favourite shirt, etc.), you'll get some idea of the printer's capabilities.

Ink bleed: This happens when the printer is pushing out too much ink onto the paper. Of course, you need to ensure that you've selected the right kind of paper in the printer's options menu, but after that, there shouldn't be any noticeable ink-bleed. This is most prominent in text rather than in images, so take a test print with text in various sizes and colours and then use a loupe to check for bleed.

2. Laser printers

Since these printers are mostly for office use and laser printers largely offer the exact same print quality, you're only really looking for reliability and suitability to your work environment, not to mention operating costs.

Print volume: You need to determine what your monthly print volume is as all laser printers are rated based on that. Some will have a recommended volume of 500 pages per month, others, more. If you're going to be printing a lot of content, just grab a printer rated for high-volume as these are designed to handle that extra wear and tear.

Printing costs: This is an aspect that we'll touch on a little later, but suffice to say that when printing a lot, cost of operation is an important factor that will determine your purchase. Do check if your manufacturer offers high-yield cartridges or some sort of official refill option as this will considerably cut down on your printing costs.

Print speed: This will not matter if you're printing barely 10-20 pages at a time, but if you regularly print larger documents, then you'll need to check this aspect. Take a heavy document (with lots of text and some images) and set the

printer to print a 100 pages (don't worry, this isn't too expensive and that much paper will only cost ₹50 or less). Printers with a low quantity of RAM will struggle after about 20 pages and you'll see these printers pause to take a breather. If that doesn't bother you, you can ignore it, if it does, take a printer with more RAM.

Startup time: You may not realise this, but many laser printers take quite a bit of time to startup and the first page may not be out for even 30 seconds. If this is something that will bother you, turn on a printer, let it go into its sleep state and then give it a print command. The time to the first print is what you're looking at.

Print quality: As mentioned earlier, this shouldn't be your primary reason for purchasing a laser printer, but, there is some variation in print quality and if you're really finicky about it, create a document with text sizes ranging from 1pt to 40pts in a font that you know you'll be using. Also, don't forget to include the point size that you'll be using regularly. Take a print of that document from various printers and use a magnifying lens or loupe to check the quality of the print. You're looking for overlapping characters and ink-bleed.

3. Ink-tank printers

These printers differ from inkjet and laser printers in that they squirt liquid ink onto the page. This ink is cheap, so the cost of printing is also cheap, but these printers can be expensive, making them more suited to high volume prints. All the

tests mentioned previously apply to these printers as well with one exception. These printers are NOT meant for photo prints on any sort of paper. These printers are just meant to give cheap, colour prints.

The most important thing you need to keep a lookout for here is ink-bleed as this is a serious problem with this tech. When going for this printer, it's always a trade-off between ink-bleed and cost and usually, cost wins.

Cost of ownership

We've left this out for last, but particularly when it comes to ink-tank and laser printers, this is the most important aspect to consider. Most manufacturers claim that their print rates are around ₹1-5 per page, and that's true, but that rate is almost exclusively determined by the cost of the cartridge and its yield. What do you do when you have a choice between a ₹5,000 printer that yields prints at ₹1 per page and one that costs ₹10,000 and yields prints at ₹0.5 per page?

Here's what you do (for a laser printer):


- Cost of printer: X
- Cost of cartridge: Y
- Page yield of cartridge: Z
- Your estimated print volume per year: A
- Estimated life of printer (years): 3 (going by the average warranty period, but you can modify this as required.)
- Estimated print volume over the life of the printer: $3 \times A$
- Number of cartridges required over the life cycle of the printer: $(3 \times A) / Z$
- Total cost of cartridges required: $B = Y \times ((3 \times A) / Z)$

Therefore, the Cost of Ownership would be as follows:

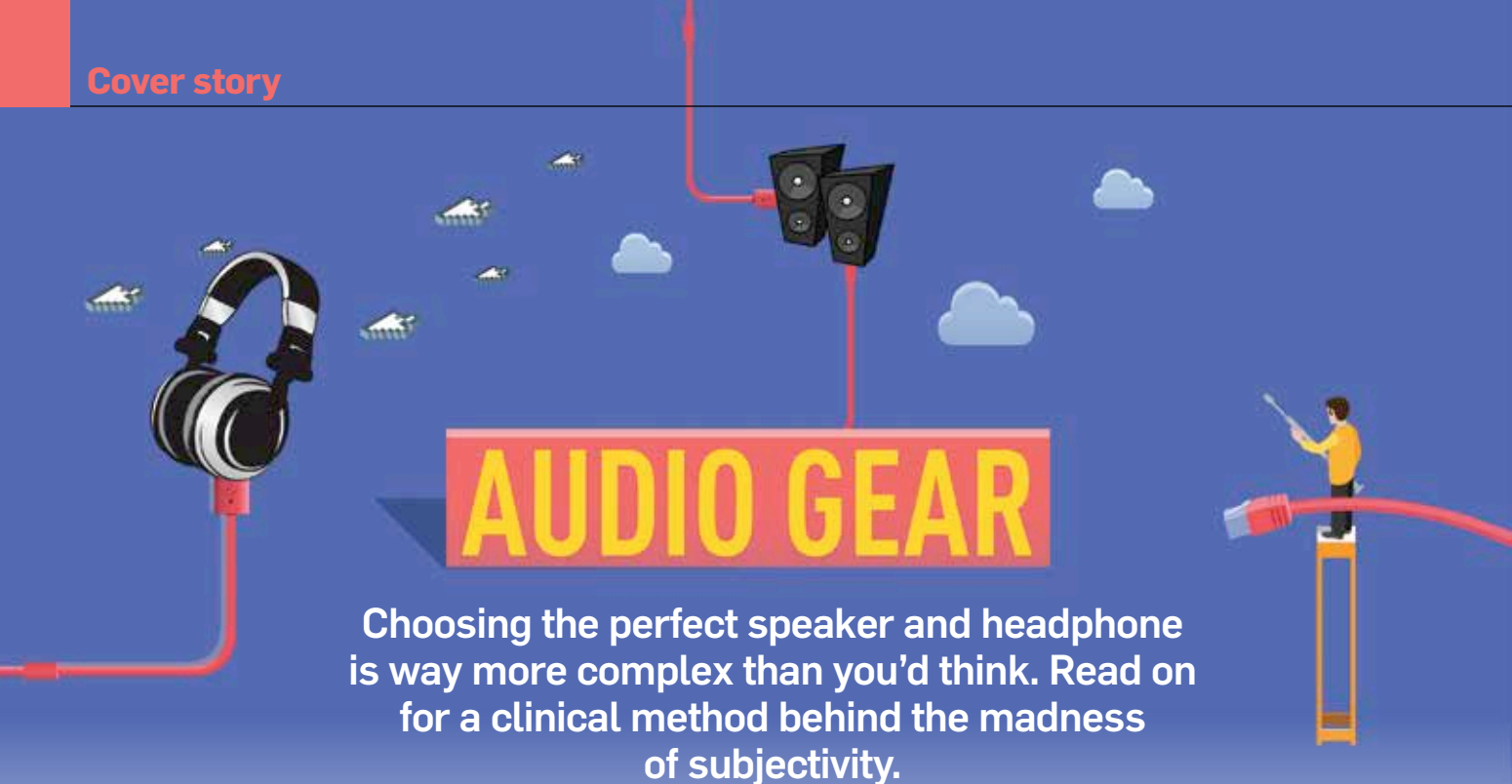
$$COO = (X + B) / (3 \times A)$$

Everything else being equal, the lower this value, the better. For colour printers, you need to estimate the number of colour vs. black and white prints that you'd use and expand the formula to account for the cost of colour cartridges. Especially if you'll need CMYK cartridges.

How DO we test printers?

All of the above, plus a detailed record of printing time under a variety of load conditions. More importantly, we use a Datacolour SpyderPRINT (<http://dgit.in/1d9px4V>) unit worth ₹25,000 to create an ICC profile for a printer and verify colour accuracy. 





Choosing the perfect speaker and headphone is way more complex than you'd think. Read on for a clinical method behind the madness of subjectivity.

By **Siddharth Parwatay**

While most people don't give it much thought, audio equipment is one of the most diverse, popular and far-reaching product categories out there. From the purely functional earphone to the most opulent receivers and amplifiers – audio products are distinct and often at far ends of the quality spectrum. Most regular folks though are only ever in need of good headphones and PC speakers or at the most portable bluetooth speakers. For this guide, we'll mostly be concentrating primarily on these categories.

Audio is subjective

That old adage of one man's food being another man's poison holds true even in the realm of audio products. Personal preferences overwhelmingly dictate what's considered good or bad. In the simplest of terms, one can think about how some prefer bass while others prefer treble. Strictly speaking, however, that's not the way one should define how good or bad an audio product is. Ideally, a speaker or headphone should be judged by how "true-to-source" the audio actually is. That is, does the speaker reproduce a particular audio track the way the sound engineer mixing it intended it to sound?



Use this to colour your audio all you want, but don't buy speakers predisposed to sounding a certain way

How does one judge that? Is it even possible?

To understand the complexity of the problem we're dealing with, here's a thought experiment of sorts: Think about colours. You know, red, blue and green – those colours that fill the letters in the Google logo. How can you be sure that the way you see the red is the same way the person sitting next to you sees red? You'd really have to get under their skin and into their mind to be able to really experience their experience, right?

Similarly, if we tell you a speaker produces great bass, how are you to know it's indeed great? Your perception of great bass may be completely different from ours. So in the end, does it come down to our word over yours or vice versa? Yes and no.

Minimising this subjectivity is the holy grail of audio testing. And the only way that can be done is by way of empirical testing through machines. It's been an endeavour here at Digit also, but the kind of equipment you need to be able to do

that isn't easily available and impossibly expensive. Back in 2010, we'd done a test with a recorder with a flat response microphone for testing speakers. A software utility which records frequency responses and plots graphs was used to analyse a frequency sweep sample beginning at a rumbling 20 Hz and going right up to a screeching 15 kHz. Unfortunately, the equipment and environment wasn't sensitive enough to provide too much variance between different speakers.

Which is why for the sake of comparison, you need an industry standard "reference". A speaker or headphone that is known/proven to be flat response. Flat response is a simple concept to understand. It means that the frequency curve produced by the speaker or headphone is flat (or near flat). That means no frequency range – lows (bass) or highs (treble) – is favoured over the other.

But what if you prefer one frequency range – be it bass or treble – over the other? If the speaker is capable of reproducing audio true-to-source, all you need to do is alter the sound going to the speaker. Or you can use digital sound processing (or DSP) to enhance bass! Want to subdue mids to get crunchier guitars? Go for a U-shaped EQ setting. Whatever you do, the speaker will reproduce it faithfully. This is the reason purists are frequently at loggerheads with "audiophiles" who prefer their speakers to be permanently tuned to output a particular type of sound (or "signature" as they call it).

By now, you must have observed that despite our best effort to avoid doing so, we've ended up using quite a lot of jargon. These terms are unavoidable when you step into the world of audio, hence the next section on interpreting reviews will shed much needed light on the subject and de-mystify many things for you.

Interpreting reviews

Because empirical testing is difficult (believe us, we've tried), audio reviews tend to be full of ambiguous adjectives. And in instances when there's no ambiguity, there will most certainly be plenty of jargon.

Case in point:

"The latest high-impedance, low-sensitivity headphones under review were difficult to drive and necessitated an amp, but the sound signature was devoid of

any colouration; neither bright nor warm, just neutral. The soundstaging is phenomenal and the entire frequency range is reproduced accurately – from deep lows to extreme highs – the drivers were pristinely accurate".

Say what?

Understanding terminology

Impedance: "Impedance" is the resistance against electrical flow. In the world of audio gear too, it means the same thing. Measured in Ohms, it basically denotes how difficult it is to move the speaker's driver. By and large, high impedance systems require more power to drive them, hence requiring an amplifier to enhance the signal.

Sensitivity: Another often seen term in the specifications of audio systems (speakers or headphones) is "sensitivity". Sensitivity is the sound pressure level measurement (loudness) taken at a distance of one meter by applying one watt of power. The sensitivity is measured in decibels (dB). Therefore, all other things being constant a high sensitivity audio system will require less power to sound as loud.

Frequency response: The entire audio signal coming out of a speaker belongs to different frequencies of the audio spectrum. The audio range of speaker systems (and the human ear) lies in the range of 20 Hz to 20,000 Hz. The frequency response of a speaker system denotes the range of the frequencies that it can reproduce effectively.

Highs: This term denotes the reproduction of frequencies belonging to the higher end of the audio spectrum. Generally, anything above 5,000 Hz is classified as high frequency. Certain instruments and vocals pitches – such as violins, female vocals, cymbals, etc – belong to this higher side. If a headphone has good "highs" it will be able to reproduce these sounds well.

Lows: Bass notes or "boom" like sounds belong to lower frequencies in the audio spectrum. These are frequencies measuring 20 Hz to 350 Hz. Kick drums, bass guitar and baritone vocals are low frequency sounds or "lows".

Mids: All sounds in the range of 350 Hz to 5,000 Hz. This range brings the overall feel of the audio track. What

people commonly refer to as treble starts from mids and extends into the highs.

Neutral: A "neutral" sound signature is one that reproduces all frequency ranges appropriately without emphasis on any particular range such as bass, mids or highs. Such audio systems are considered true-to-source.

Warm: A "warm" sounding speaker or headphone is one that's a little partial towards the mid frequencies. The sound produced as a result is a little mellow and soft. Whether or not you like this kind of sound is a matter of preference.

Bright: A "bright" sound signature is one that's produced by audio systems with a proclivity for high frequencies. The sound produced as a result is vibrant and hence called bright.

Colouration: Any component in the chain of audio equipment from the source itself to the speakers that adds emphasis on a particular frequency range is said to "colour" the sound. Colour, as it's used here, can even be given a derogatory connotation similar to "taint". The process is called "colouration". Colouration may sound pleasing based on your preferences, but it's a deviation from accuracy.

Soundstaging: This is a pure listening term and the efficacy of it can be debated. Basically, it denotes the perception of depth and positioning of particular sources of sounds such as instruments and vocalists. Some headphones and speaker systems are thought to reproduce or create the illusion of distinct positions of sources within the spacial environment.

Amp: Short for amplifier, "amp" refers to a device that amplifies or enhances the audio signal level. Amplifiers increase power or voltage or both. Headphone amplifiers are quite popular in India these days. Such amps typically give a power output in mWatts (sometime upto 2W). Amps also add colour to the sound.

Dynamic range: It can be defined as the ratio of the loudest and softest sound that an audio system can reproduce without distortion. Again, the ratio is measured in decibels.

Testing headphones

The first step towards making good buying decisions when it comes to headphones is knowing what type of headphone is best for you. And what's best for you depends solely on your use case

scenario and budget. There are several types of headphones (in-ears are also headphones) and each one brings with it a set of advantages and drawbacks.

Understanding types

In-ear: In ear headphones, or IEMs (in-ear monitors) as they're popularly called, are the type of headphones that are inserted in the ear canal. IEMs are responsible for making the esoteric world of audiophilia accessible to normal people. Because the driver is so close to the eardrum and they manage a good seal, IEMs by and large sound quite good. They're cheaper compared to proper full-sized headphones that deliver a similar audio experience. In-ears are small, easy to carry and preferable for use during daily commutes. Today, there are many specialised variants available even in the IEM space.



In-ear headphones or IEMs

You have rugged headphones that are meant for wearing while running or gymming. These tend to be water resistant or sweat proof. Many come with flanges or specially shaped tips that latch on to the grooves of your cochlea for stability (like the ones pictured). You also get active noise cancelling ones.

Supra-aural: These headphones are the kind that rest on top of your ear. They're usually designed with portability in mind so they may have folding mechanisms on two axes. Most people don't find supra-aural headphones very comfortable but many others don't have any complaints with the form factor at all. So it's all a very subjective thing. Borrow a pair from your friends and try it on for an



Supra-aural headphones: They fold and sit on your ear. May or may not be your thing depending on your comfort expectations

hour or two to really get a feel for whether this format works for you. Important things to consider while assessing supra-aural headphones are clamping pressure, pad material and build quality. Clamping pressure and the materials used for the ear-pads go a long way into making them comfortable. If they press too hard on your ears you'll feel uncomfortable after a while. At the same time, they can't be so loose that a minor shove will dislodge them from your head. Good quality ear pads these days are made of materials that don't get too warm and sweaty. Supra-aural headphones are sometimes called "on-ear" and "over-the-ear" too, and there are minor design variants dubbed "supra-cochlea" and "intra-cochlea" or some other hard-to-remember terms, but you don't really need to bother with those. If they don't completely encircle your ear, they're supra-aural.

Circumaural: These are headphones that go completely around the ear i.e. headphones that encompass the ear. By far, these are the most comfortable of the lot. This is also the form factor of choice for extremely high fidelity units to come in. Circumaural headphones are big, not necessarily heavy, but they just occupy a lot of space. Ideally, they're meant to be listened to at home, preferably through an amp if you happen to have one. If you want good audio at a fixed place with the utmost comfort you should consider this category.

Open, closed back, semi-open: These are not really types, but more like construction styles for all three aforemen-

tioned types of headphones. The construction style refers to the kind of housing the drivers are enclosed in. So, for example, if the back side of the ear cups is completely closed, they're "closed back". This means that outside or ambient noise is kept to a minimum while at the same time sound from the headphones doesn't leak outside. The choice of enclosure affects the sound quality quite a bit. "Open back" headphones feel well open and airy and the audio feels more expansive. This is often referred to as the soundstage being wider. There are open back IEMs too these days, especially in the fitness sub-segment. The



Max comfort and max heft. An example of a circumaural headphone

idea is to deliberately keep wearers aware of their surroundings, since runners run on streets and are prone to accidents.

Testing speakers

Regular speakers: Contrary to what anyone will say, the best way to listen to music is on a stereo speaker system. All your 5.1 / surround are good for movies and explosions, however, for music it's always stereo. So, either a 2.1 channel speaker system (with a sub-woofer) or good old 2.0 bookshelf speakers should be your focus. For a long time (until consumers smartened up), the trend was to

large, these days is within arms reach of any one, except for really high-end SKUs from premium brands. Features such as USB charging and daisy chaining are very useful, and you should keep an eye out for those.

What can you do at the store?

Not much to be honest because of mainly one reason – if you're buying headphones, especially the in-ear variety, chances are you won't really get "open" pieces to demo. If you're in the market for speakers, you're in luck and demos might



A 2.1 speaker set with a control pod

display power rating of speakers in PMPO. In fact, for bundled home theatres it still is. Don't go by this figure as it's highly exaggerated. Instead, go by the RMS rating. A speaker system with an RMS value of 80 watts or more should be loud enough for a mid-size room. Speakers these days also try to bundle plenty of features. Some may be useful such as an FM tuner (debatable) while some like SD card playback seem anachronistic in today's day and age. Seriously, when was the last time you played back any music from an SD card? Even if you want to play music from your phone, you'd probably just insert it into the AUX-in via a standard 3.5mm cable. A control pod for volume, bass and treble is a useful feature. So is bluetooth connectivity.

Portable: The most important thing that differentiates portable speakers from one another isn't sound quality sadly, but the features list. Sound quality, by and

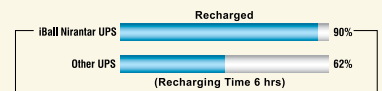
not be out of the question. But remember: at most electronics shops, the audio that the sales staff plays for you may not present an accurate picture of your preferences. Take sample tracks with you. But which tracks? Take your favourite music along. Music you're familiar with or have listened to on decent headphones/speakers will help form at least some reference point. Ensure that the tracks are high bit rate – at least 320 kbps. This will give you an idea about whether the speakers sound good for your genre of choice. However, this is still not good enough to know whether the speakers play back all frequency ranges properly. For this, download sweeps and different frequency tones. One such source is NuForce (<https://goo.gl/g6RYdu>). Carry these in a pen drive fully uncompressed or in different file formats, or better yet burn a .cda album. **f**



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TELEVISION

So, what's it gonna be, LED or OLED? 1080p or 4K, does it have to be smart? Can I get a 50-inch panel in my budget? What about the new curved screens, they look awesome!

By **Soham Raninga**

The temptation of getting yourself a big screen TV is justified, given the drop in prices and a flurry of cheaper big screen TVs from newer brands making their way into stores. So, where do you start? And, how do you get yourself the right TV(LED TV) that matches your requirement and also fits in your budget? The easiest way to go about doing it is to follow 3 steps- understand what's important for you and what kind of features you want from your new TV, map your requirements to the available options in your budget by building a shortlist. And finally, go to the store, test and try out the TVs that you have short-listed and make the final decision.

In this guide, we shall help you through all the 3 steps while also giving you an easy check-list that you can follow and take along when buying a new TV

Decide on the screen size and resolution: In terms of screen size, you have three clear options – 32, 40/42 and 50+ inches. We strongly recommend you skip the 32-inch screen size unless your budget is too tight or the viewing distance is too short for you to accommodate a larger screen. If any of the two don't apply, don't bother with a 32-inch panel. When choosing between 40/42-inch screens and the larger 50-inch screen size, your

primary decision has to be driven by the viewing distance (the distance between the TV and your seating arrangement) and the screen resolution under consideration (1080p or 4K). Yes 4K is now affordable. While content is still an issue, you could still consider opting for a 4K TV, assuming you would stick to it for 5-8 years. However, please be wary of those ultra low-cost 4K TVs that tease you with their unbelievable price tags (more on this in the next para). A lot has been said on how one cannot make out the difference in image quality between a 4K TV and a 1080p TV at standard viewing distances

(5-9 feet). We humbly disagree with most of those conclusions. You will most certainly realize the difference in terms of image quality between a 4K TV and a 1080p TV provided both are playing the same content in the native resolution of the TV. Though, the maximum impact of 4K or UHD resolution is felt on larger screen sizes (50-inch and above). For anyone considering a 42-inch panel, if going 4K is a part of your consideration, but does not come under the 'must-have' features list, we suggest you buy a good quality 1080p LED TV with local dimming and save that cash to upgrade



to a 4K TV in the next 3-5 years. 4K TVs and LED TVs in general are expected to get a lot cheaper in India over the next 2 years and you will be able to shorten your upgrade cycle due to the upcoming crash in big screen TV prices.

Inexpensive 4K TVs can be evil:

Low-cost 4K TVs often come with crappy panels that only support 4K at 30 Hz, that is basically limiting the video playback to a 30 Hz refresh rate per second. And, they suffer from awful judder when playing fast action content (sports channels, content that contains rapid panning, etc.). What's worse, many of them come with default up-scaling, so when set to 4K, they upscale SD and HD content to 4K and hence force the 30Hz refresh rate on regular content as well, adding the same awful judder to everything that plays on it. The minimum refresh rate that you should settle for for ANY LED TV you buy should be at least 50/60 Hz at all resolutions supported.

Smart TVs can be useful but don't expect them to be 'Smart':

If you want your TV to offer wireless connectivity for internet access and connecting other devices (phones, laptops, media streamers, etc), a smart TV will help. Smart TVs offer built-in Wi-Fi and device-to-device wireless connectivity via common standards such as WiDi, Miracast, etc. One of our primary complaints about a lot of Smart TVs is on the interface and usability area. Smart TVs either offer a customised interface or a Smart OS, a layer that allows you to use the additional features of the TV better while offering all the basic entertainment applications that you would need on an internet enabled device. Sure most Smart TVs manage to tick all the boxes in terms of the interface/OS offering all key features, but the way you access them and the user interface can be a nightmarish experience. And, it isn't just about a steep learning curve, issues such as slow response times of menus and awful pointer-based navigation will make you cringe each and every time that you use them. So, while Smart TVs do bring internet access and device sharing capabilities, they unfortunately are still away from being smart enough in terms of a

smooth, seamless experience. Having said that, there are a few good WebOS based Smart TVs in the market from LG which offer better UI and overall experience and we also expect TVs based on special Android versions for TV to get introduced this year. So, better (and smarter) smart TVs are around the corner. Buyers who plan to make heavy use of the smart features of the TV and use them frequently for web access should particularly ensure that they check the interface and overall usability quotient of the TVs apart from just matching the spec requirement.

Don't bother with 3D:

Yup, nothing much to say here, unless the 3D feature comes at no extra cost, don't go hunting specifically for a 3D TV. Content is sparse, implementation is sub-par and 3D is best left and experienced in theaters.



Curved and OLED screens:

OLED TVs do offer the best picture quality in terms of colors, contrast, black levels and also the response time. So, if you are sleeping on wads of cash, go ahead and splurge on that OLED TV, it will surely give you the best visual experience. Curved screens on the other hand are more of a technological achievement rather than a market need. The impact of curved screens is limited to 55-inches and above screen sizes and in our books, the impact itself isn't substantial enough to justify the price difference. Having said that, curved TVs do look awesome and will go a long way in enhancing the aesthetics value of your room. If you do want the best value for your money, curved and OLED TVs aren't recommended at their current price points. Even though current OLED TVs do offer the best overall picture quality, OLED TVs are expected to get cheaper and better over the next 2 years.

Sound:

The race towards slimmer, lighter, TVs has resulted in slimmer, lighter TVs that sound like crap. And, in most cases the sound quality from big screen TVs will be adequate at best. There are certain exceptions, the Sony X9 series for example offers pretty good sound quality out of the box. But, it also demands a heavy premium for doing that. If you aren't going to attach extra set of speakers/home theater to your TV, we strongly recommend you to thoroughly test (more on this later) the sound quality of the TV at the store before making your final decision. Poor sound quality can heavily mar the final experience of a big screen TV, we've come across numerous examples of frustrated buyers who are in utter disbelief of how the sound output from their big screen TV is low and highly suppressed in terms of quality and sound stage.

The Jargon: Specs that matter

LED Type: Before going on to the types of LED TVs, let's clear the common misconception around LED TVs. All LED TVs are basically LCD panels with LED based backlight. The type of implementation of light source for the panel using LED arrays has a big role to play in the final picture quality. Most TVs in the market today are edge lit, meaning the LED arrays that light up the panel are placed at the edges of the panel, right along the bezels of the TV. The next type of LED TVs are the 'Direct LED panels', here the LED clusters are placed behind the panel, these TVs generally tend to be a little more bulkier than the edge-lit LED TVs. The third and rare type of backlighting is the 'full array' backlighting, this is similar to direct LED in terms of LEDs being placed behind the LED panel but full array denotes that evenly lit panel due to higher number of LEDs placed evenly across the entire panel rather than the cluster method used in Direct LEDs. All three LED backlight implementations can be supported via 'local dimming' technology. Local dimming offers better contrast and more balanced image quality, thanks to the ability to control LEDs as per the image displayed on the screen. The combination of Full array backlit LED panels with local dimming technology is the best one in terms of image quality. Unfor-

HOW YOU TEST IN A RETAIL STORE

When it comes to TVs, the showroom demos given by sellers can be highly deceiving. Here are some tests that you can perform while at the store to get the real picture.



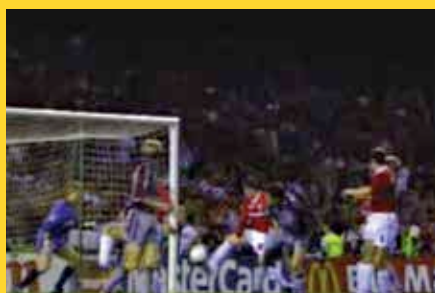
1 Carry your own content (movie clips with fast action scenes, sports clips, movie clips with dark scenes, etc) in a pen drive to test the TV performance. Carry multiple pen drives with the same content (if possible) to be able to check and compare performance between two TVs at the same time.



2 Ensure you keep all settings to default or 50% (in case of contrast and brightness levels) and turn off all extras (motion control, dynamic contrast, dynamic depth, etc.)



3 Play each type of content and check the performance in terms of how the TV handles fast/action based scenes, dark scenes and overall color reproduction. Do not compare TV performance on basis of the looping demo clips that are played on TVs.



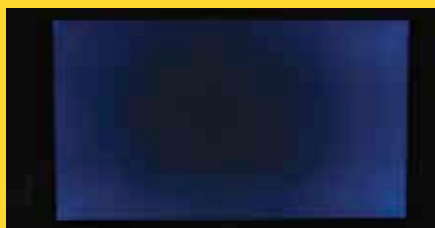
4 Ensure you switch to regular SD channels to check how the TV handles regular standard definition content. The image processing and upscaling engines can make a big difference to the quality of regular TV content.



5 Evaluate the viewing angles, check for color shifts and loss in color fidelity as you pan from left to right.



6 Try the interface and smart capabilities by actually syncing your phone with the TV, beam content to the TV and check for speeds, frame drops, lags etc.



7 Detect backlight bleeding and unevenly lit panels by carefully looking at the edges of the screen when playing a dark scene, any kind of glow or uneven lighting at the edges denote backlight bleeding and isn't preferable. Similarly many TVs suffer from uneven panel lighting. Look for patches or dark spots by setting the TV to display solid colors, especially whites. You can do this by taking solid color image files (jpegs) most TVs with USB slots should be able to play them as photos/images.

Unfortunately, higher costs and the bulkier nature of these panels has led to very few manufacturers offering such TVs. Most LED TVs sold by grade A manufacturers (Samsung, Sony, LG, Panasonic, Tohiba, Sharp, Hitachi, etc) are edge-lit LED TVs, the expensive models offer local dimming while the budget models usually don't. The type of LED panel used in a TV is

rarely mentioned as a part of the marketing materials/activities. You'll have to dig into the full lists of specifications to get the information.

Panel type:

IPS and VA are the two most common panel types used in LED TVs, IPS panels (used by LG and Panasonic) offer better

quality colors in terms of being more natural, better depth and excellent viewing angles. VA panels (commonly used by Samsung and Sony) offer slightly better contrast and punchier/vivid colors than IPS panels. Though VA panels are known to suffer from color shift and input lag issues. Given the various grades of panels for both panel types, the real quality dif-

ference isn't limited to panel type alone. Even the grade and manufacturer of the panels matter a lot. Both IPS and VA panel technology has improved over the last several years, working on perfecting its strengths and eliminating its weaknesses. As a result, the actual difference can only be judged by taking a demo of the TV and comparing various models to arrive at the better panel. The ultra affordable TVs often tend to use lower quality panels to save cost. Having said that, there are exceptions in the market who claim to use A+ grade IPS panels. However, most low cost TVs with good quality IPS panels cut corners over LED backlight implementations, they usually offer Direct LED based backlights with very few LED clusters at the back, impacting contrast performance and ending up with unevenly lit panels as well.

Number of HDMI ports:

Look for a TV with a bare minimum of 2 HDMI ports. Though, we recommend you to opt for a slightly more future proof solution that offers 3-4 HDMI ports, ensuring you can connect more devices to your TV.

Refresh rate:

As explained earlier at the start of this guide, refresh rate is particularly a crucial factor for low-cost 4K TVs, with some of them delivering a rather low 30hz refresh rate at 4K resolutions. Most 1080p TVs offer 50/60 hz refresh rates ensuring smooth playback of video that is shot at 60 frames per second. A lower refresh could cause judder and choppiness during video playback due to the inability of the panel to refresh quickly enough as per the video being fed to the panel. While most movies were earlier shot at 24/30 frames per second, sports channels and even some of the latest movies are shot at 48FPS, thus further validating the need for a TV that has a panel with minimum 60hz refresh rate being offered at all supported resolutions. Also, one should not confuse the often quoted and heavily marketed terms like "Ultra Motion" or "Motion Clarity Index" with refresh rates, these aren't native or real refresh rates but forced refresh rates derived by using frame interpolation methods. These implementations hardly make any difference and in fact may sometimes even degrade the image quality.

Panel glass finish:

LED TVs come with two kinds glass finishes, glossy or matte (semi-glossy). The glossy finish offers slightly more contrast at the cost of causing ugly reflections. We recommend you opt for matte panel based TVs unless your viewing setup is well controlled in terms of lighting.

HDMI Return Channel/ HDMI ARC Support:

This is an important feature if you plan to connect your home theater/receiver to your TV, with the HDMI Audio Return Channel port, you need fewer cables and can manage volume levels of all multiple input devices via a single remote.

Contrast Ratio:

While contrast ratio is a very important specification for a TV, the insanely high quoted figures along with confusing and arbitrary labels such as 'dynamic' or 'mega' contrast are fake and should never be taken on face value. We suggest you



ignore all contrast ratio claims made by manufacturers unless you come across a number that reads more like 1000:1 or 2000:1. Very few TVs can manage an actual contrast ratio that goes beyond 1000:1. Also, the measuring criteria and environment in terms of brightness levels and calibration of a TV play a very important role in the process of contrast ratio measurement, hence it is recommended you compare contrast ratios rather than taking any absolute figure.

USB connectivity and playback support:

Most TVs offer USB 2.0 ports, even the basic inexpensive models. USB ports

allow you to play media files directly via USB based storage devices. 4K TVs offer USB 3.0 ports for higher bandwidth video transfer.

Built-In WiFi, Miracast/ WiFi direct:

Given the fact that smartphones are at the core of most peoples tech ecosystem today, support for beaming content directly to the TV and screen mirroring ability can be more than handy. A lot of TVs that aren't exactly Smart TVs in the true sense do offer basic WiFi and Miracast features, if you aren't particularly interested in a Smart TV, we suggest you look for TVs that offer these basic wireless connectivity.

Speakers position, rating:

A TV with 20W RMS sound output is the bare minimum that you should settle for. Apart from the output, the position and direction of sound matters a lot. Front facing speakers will offer

better sound quality in terms of fidelity and clarity over rear or down facing speakers. Unfortunately, the craze for slimmer, narrower bezels and minimal designs has led to manufacturers opting for back firing or down firing speakers where the drivers are placed at the bottom (facing the ground) or at the back (facing the wall) to maintain the minimalist look. As a result, sound quality does get heavily compromised. Also, be wary of fancy 'dynamic' or 'virtual' surround sound claims by TVs, such gimmicks don't deserve a premium and should be set turned off to ensure you get the most 'clean' sound that the TV is capable of. **[E]**



Cameras maketh a photo just as much as any photographer. Here's how YOU can test the former!

By **Anirudh Regidi**

The joy of capturing a great image is hard to describe and the credit, despite what some might tell you, is all yours. The camera has a big role to play for sure, but its role is only limited to that of a tool; you give Michael Schumaker your battered old Fiat and he'll still do things with it that you never thought was possible. A better camera, as with a better car, will only let you do so much and just because you have a Ferrari doesn't mean that you're a great driver.

Cameras come in a variety of shapes and sizes and are festooned with such a plethora of features that a layman is sure to be completely flustered by the choices on offer. Before we even begin considering testing, we need to understand the features that we're looking at.

Types of cameras

Cameras come in all shapes and sizes and each has their specific use-case. Here's a quick run-down of the form-factors that you need to care about:

- **Compact digital cameras:** These are the simplest and most compact cameras available today. Tiny, pocketable and usually boasting of a 3x to 8x zoom lens, these cameras are what you use when you want something that'll take images better than your phone,



but only if you're in no hurry to take those images. Point-n-shoot cameras are notably slow to respond and focus, especially in low-light and are designed for shooting set-pieces rather than action. There are some exceptions of course, but even those will never be as good as more advanced cameras.

- **Travel Zooms:** These are essentially point-n-shoot cameras with telescopic zoom. The zoom levels usually range from 20x-35x or more, allowing these cameras to zoom into the eye of a crow a hundred yards away if you so desire.

Regardless, other than that level of zoom, these cameras are no different from any other type of point-n-shoot and suffer the same drawbacks while costing as much as a cheap DSLR. We recommend that you completely ignore this category unless you're absolutely desperate for the longest optical zoom at the lowest price.

- **Mirrorless cameras:** DSLRs are large and bulky because their design incorporates a "reflex" mirror and prism system that adds to the bulk of the design. Mirrorless cameras don't have

that mirror and prism system, hence the name. Any camera without a DSLR style mirror system is technically speaking, a mirrorless camera, but we generally use this term to refer to more advanced cameras with interchangeable lenses.

- **DSLR:** If you want a camera that's flexible, fast and precise, a DSLR is what you're looking for. In this type of camera, the light enters through the lens and is bounced into an eye piece and focussing system by a mirror. When you press the trigger to release the shutter, the mirror and shutter both move out of the way to expose the sensor. Because of that dedicated focus sensor in particular, DSLRs are exceptionally fast at focussing on something, especially on moving objects.

Specifications that matter

Sensor size: This is by far the most important thing to consider when purchasing a camera. Put simply, the larger the sensor (the greater its area), the more data is captured and the better your image quality. Sensor size is the reason that a 12MP SLR captures better images than that 20MP phone camera.

The most prominent sensor sizes that matter are as follows:

- **Full-Frame:** This is the Holy Grail as far as the bulk of professional photographers are concerned. A full-frame sensor is one with a sensor size that is equivalent to that of a single 35mm film strip. This type of sensor is almost exclusively found in high-end DSLRs and is capable of offering the best image quality.
- **APS-C:** This is by far the most common sensor size in use today (barring point-n-shoot cameras) and unless you're a professional who knows better, you won't need more than this. In fact, for most of us, even the micro four-thirds mentioned below will be more than enough.
- **Micro four-thirds:** This is most commonly found in Olympus and Panasonic cameras, this sensor is smaller than that found on most interchangeable lens cameras (more on that later). The only real advantage of this sensor over the others is that given the small size of the sensor, lenses can be more compact and are cheaper to manufac-

ture, making this a very viable, portable alternative to a bulky DSLR.

- **Everything else:** Any sensor smaller than the ones mentioned above isn't really worth talking about. The size of a sensor is usually denoted by a single figure the same way that a monitor's size is given in inches. As with monitors, that figure is only the measure of the diagonal and not a measure of the sensor's aspect ratio or pixel density. Rule of thumb, the larger the better.

A word of caution, a diagonal unit is not necessarily accurate as far as image sensors go. Many manufacturers fudge these figures by using a different naming or measurement convention (the same way that a 27" CRT is actually smaller than a 27" LCD. The only sure measure of sensor size is the sensor area.

Type of sensor: Image sensors come in two prominent flavours, CCD and CMOS. Normally, you needn't bother with this, but there are certain scenarios where this is important.

- **CCD:** Most image sensors are CCD sensors and they're usually very good at capturing image data.
- **CMOS:** This is a very sensitive sensor that's cheap to manufacture, but expensive to fine-tune. Thus, you'll find this sensor on the cheapest of cameras and on more expensive models. Avoid the cheap cameras with CMOS sensors.

Aperture size: The purpose of a lens is to collimate the light rays entering it and the aperture determines the amount of collimation and the amount of light entering the camera system. As a rule of thumb a lens with a larger aperture is a better choice primarily because you're letting more light in and will thus capture cleaner images.

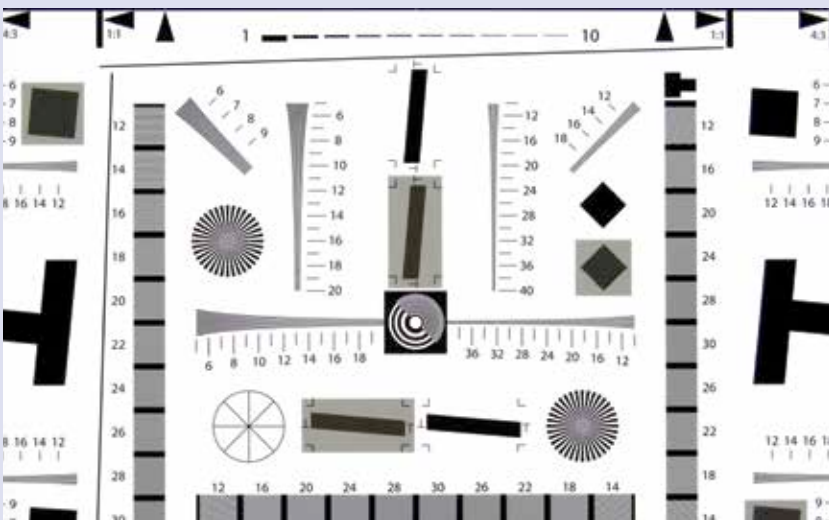
On camera lenses, aperture is determined by a figure such as f/1.8, f/4.5, etc. The smaller the number, the larger the aperture. Do bear in mind that on mobile phones and compact digital cameras this figure is largely irrelevant owing to the

HOW WE TEST

When testing cameras, we do all of the above but in environments with precisely controlled lighting with grey cards. We use a Minolta light meter to ensure that the luminance of a scene is exactly replicated from test to test and a SpyderCube to calibrate the white balance of a camera system.

When checking for tonal accuracy, each image is imported into Photoshop and we examine the colour of the SpyderCube in different lighting conditions. Since the SpyderCube is exactly 18% grey, the camera that captures a tone that's closest to the original gets the highest rating.

Regarding ergonomics, we examine just about every aspect of the camera and weightage is given to customization options, the presence of custom functions, accessibility of most frequently used features, etc. We also measure other things like the time to first photo (from an off state), time to focus under specific, controlled conditions, etc.

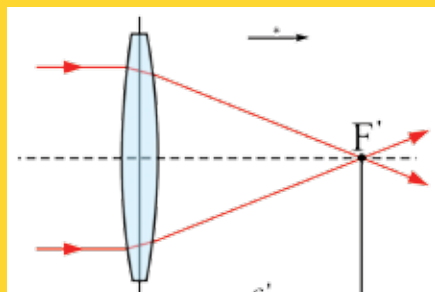


HOW YOU TEST IN A RETAIL STORE

After you've assimilated the above information, you should have a good idea of the type of camera that you want and once you're clear on that, it's time to settle on a specific model. How do you do that? The quickest way is to first glance through the specifications. Ignore things like scene modes, megapixels, digital zoom and smile detection and look for things like manual control options, Wi-Fi support (for convenience), and other things that you think you need.

Performance

1 Initial preparation: If you're going to test cameras, you need a few items with you. Firstly, you need to carry your own memory card with you. Load it into the camera that you want to test and record all images on that card so that you can check image quality at your leisure. Another essential item is a white sheet of paper (more on that later) and, if you're willing to setup your own



scene to test, an assortment of items to create said scene including:

- A piece of cloth with noticeable texture
- An assortment of colours in the form of paint bottles, threads, crayons, etc.
- Some object with fine, precise detail such as a wristwatch
- If possible, a card with an 18% grey background

2 First impressions: To test the capabilities of a camera, first take a photo in low-light. Even if you're in a store, try to take the camera to a darker region of the store and take a photo of something, anything. Ideally, you'll need to take a photo of a surface with a lot of fine detail like, say, the face of a wrist watch or a textured surface of a dress. What you're looking for is detail, the amount of noise in the image, especially in the darker regions.

Depending on what sort of camera you're looking at, don't expect miracles because most cameras will struggle here and you're only

looking for comparatively better performance among the cameras you're looking at.

Take pictures of people, with and without the flash, try to get images in neutral lighting (such as in daylight), images of movement (this could simply be crowds walking, people on an escalator, etc.).

3 Focus: To check the camera's ability to focus and the focussing speed you just need to try to focus on various subjects in various lighting conditions and with various backgrounds and subjects. Also photograph moving objects and check focus speed and the ability to track said object.

Another thing to check for is the camera's ability to focus on multiple subjects at various distances (depth-of-field). To do this just get a bunch of friends to stand in a group at various distances from the camera and take a photo while focussing on the centre of the group and you need to see if everyone is in focus.

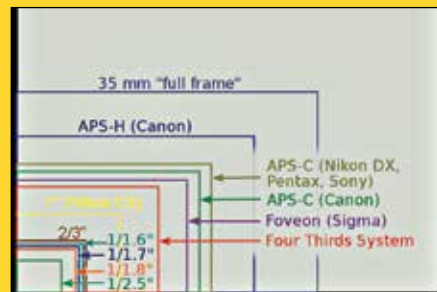
4 White balance: The colour tones that a camera displays is very dependent on its ability to adjust to various lighting conditions. The easiest way to test for this is by using a white sheet of paper (ideally you'd need



to use an 18% grey card such as this one: <http://digit.in/1SeOD46>) and take photos of that sheet under tube lights or fluorescent bulbs, under incandescent bulbs (even table lamps) and in daylight. Make sure that the camera is set to spot metering though. If the camera is good,

the white sheet of paper should look white (or close enough) in all lighting conditions.

5 ISO: This is an easy test. Just setup your scene if you can, if you can't just look for a scene with consistent lighting. Choose a location for your camera and if the option is there, lock white balance and focus. Set your ISO to its lowest value and take a photo and keep taking photos at progressively



higher ISO values. You need to examine each and every image for noise and decide on what you think is tolerable. The higher the ISO, the better the camera's performance in low light.

Compact digital cameras will usually manage good performance up to ISO 200, better ones might manage decent images at ISO 400. Cheap DSLRs should give you acceptable images up to ISO 800 and good cameras will easily manage ISO 1600 and beyond.

6 Resolution: This is a test of the ability of a camera to resolve fine details and is not to be confused with MegaPixels.

Now we use the WG-13 Resolution Target (Google it) for this and you can too. You can purchase an approved test chart from certain photography stores or print one out yourself. All you need to do to check image resolution is to place the target at a fixed distance from the camera lens (we keep it at 6" from the camera) and set the camera to its highest MP setting and lowest ISO. Capture the image and examine it on a good computer screen at 100%

zoom and examine the image, noting the number of discernible pairs of lines that are visible. The more the merrier.

Ergonomics

Ergonomics are a very big factor when it comes to choosing your camera because how you use your camera will have a big impact on your photography. For example, if you're looking for a camera that you're going to use every day, a lightweight camera with well-placed buttons will work wonders and if you're looking for one to stuff in your pocket, obviously, the slimmest camera is the one that you want.

Pick up the camera and take a photo with it. If you're holding the camera correctly, the camera should be stable when taking the shot. Your fingers should be able to easily access the shutter button and the resistance shouldn't be too high. At the same time, check for tactile



feedback when you half-press the shutter to focus. Another thing to note is that when taking a photo is that your fingers shouldn't be covering things like focus assist lamps or that you're almost pressing other buttons that you don't need. Basically, the camera needs to feel good in your hands. If you're looking for a pocket-able camera, put it in your pocket. The next thing you need to look at is the menu and how easy it is to access and set the following options:

- ISO
- Exposure
- White Balance
- Focus Modes
- Shutter Speed
- Aperture Size

extremely small size of the sensors and lenses involved.

Shutter Speed: This is a factor that determines the length of your exposure. The longer the shutter speed, the more the light captured and the brighter the image. The faster the shutter speed, the better for capturing movement. Most good cameras will manage a shutter speed range of 1/2000 – 30 seconds, which is more than enough for your needs.

Aperture and shutter speed go hand-in-hand in determining the quality and type of image that you capture. A lens with a large aperture can use a faster shutter speed, giving you more flexibility in the kind of photos that you can capture.

AutoFocus: The technology behind your camera's AutoFocus (AF) system determines how fast your camera can focus on an object.

- **Phase-detect AF:** This type of AF system is fast and precise. It examines offset images of the same object and uses the amount of offset to determine the precise focus point. This method is predominantly used in DSLRs and is key to their precision and speed.
- **Contrast-Detect AF:** Slow and unreliable, this system uses the image sensor to determine the highest contrast between neighbouring pixels. The problem here is that the sensor will not know if an image is in focus till it passes the point of precise focus at least once.

If you're not taking a DSLR, you rarely have the option of going with a phase-detect system, however, certain types of mirrorless cameras do come with a hybrid AF system (contrast+phase) that considerably hastens the focussing process.

Focal length: This is a figure that you'll find on most camera lenses, even compact digital cameras, and it's usually represented by what's known as a 35mm equivalent figure like 28-135mm. To explain that, consider a lens as something that focuses beams of light to create an image, and in the case of a camera, that image is the size of the image sensor.

Since a 35mm image sensor is considered as a base-line, the 35mm equivalence of a particular lens is the theoretical focal length of that lens if it was designed for the same performance on a 35mm sensor. As an example, 18mm on an APS-C sensor is equivalent to 35mm on a Full-Frame sensor.

There are many ways to define focal length, but the simplest way to put it is that focal length is the distance at which a lens focuses the collimated beams of light. Since 35mm film was the gold standard for photography for quite a while, all focal length today is indicated by its 35mm equivalence.


The focal length determines the field of view (FoV) of the lens, which is effectively, an angle that describes the lens's cone of vision.

- **Wide:** This is an FoV that is very, well, wide and is a term used to describe the FoV of a lens with a focal length below 35mm and such lenses are called wide-angle lenses.



- **Normal:** A lens with a focal length of 35-50mm is generally considered to have a "normal" FoV, in other words, an FoV that very closely resembles the natural FoV of the human eye, and such lenses are called normal lenses.
- **Narrow:** This FoV is best described by a lens with a focal length in excess of 50mm and such lenses are called telephoto lenses.

Zoom lenses are lenses that have the ability to traverse a range of focal lengths, no matter how small, so something that goes from 10mm to 20mm is also a zoom lens.

Prime lenses are lenses with a fixed focal length. These lenses are usually much cheaper than zoom lenses and offer stellar image quality. 



After reading this comprehensive guide, there won't be anything left to know when it comes to buying a laptop. Also, learn the Digit way of testing and benchmarking laptops.

By **Jayesh Shinde**

In the world of computing, laptops are the new desktops, at least when it comes to purchasing decisions driving people to buy their very first computer.

No one wants a boring old box sitting on their desk anymore, people prefer laptops over the world due to their portability. And there are so many laptop types available in the market right now – Ultrabooks, Chromebooks, Netbooks, Hybrid Laptops, Gaming Laptops and more. It's a great time to be a prospective laptop owner!

With so many different laptop models and endless hardware configurations to choose from, how do you single out the one laptop that's worthy of purchase? Whether you're a cash-strapped consumer shopping for a notebook PC on a tight budget or an entertainment junkie looking to replace his aging desktop with a powerful all-purpose laptop. In the next couple of pages, we outline some ground rules to remember and abide by when you're researching your next laptop. Not only that, we also outline a quick hands-on test you can perform on any laptop in an electronics store before concluding if it's your money's worth at all. And lastly, we complete this buying guide by empowering you with tools and techniques that let you effectively benchmark and diagnose your laptop's com-

ponents – most of which Digit uses right here in our Test Center while testing and reviewing laptops.

Processor

This is the heart and soul of your PC, an important cog to consider. AMD or Intel is an age old question that's still a matter of serious debate among enthusiasts the world over. While things may not be plain and simple in the PC world, in the laptop world the advantages and disadvantages are clear as day.

Before we sort that out though, bear in mind that this is the single most impor-

tant component in your laptop. Laptops aren't traditionally meant to be power-houses, but a good CPU goes a long way in ensuring a more comfortable computing experience, and in future-proofing your device.

Intel: For a bare-bones laptop, anything above Intel's Celeron 1000 series of CPUs (i.e., any CPU launched since 2013) should suffice. From every test we've conducted, one thing's blindingly obvious – if you're going for a laptop, get one that's powered by Intel's Haswell CPUs (basically Intel CPUs with a model number that goes 4xxx). The improve-





ment in battery life over every other competing CPU is staggering. If you want a portable device, you wouldn't want any other CPU in your laptop. An i7 is simply an indulgence. It's definitely nice to have one, but you'll rarely need anything more than an i5 for most of your needs. Also remember, when it comes to gaming, an i5 + GPU combo is way better than just an i7 CPU.

If you're on a tight budget, get a Celeron powered device. For something a bit more powerful, get a laptop that's powered by an i3 CPU. If you need a good all-rounder, get a device with an i5 and an NVIDIA GPU. Obviously, if your budget permits it, an i7 and a more powerful NVIDIA GPU will ensure that you're sorted for at least two years of computing pleasure.

AMD: If you're willing to sacrifice some amount of CPU power and battery power for better graphics performance, then AMD's APUs were created for you. You'll identify these CPUs by the "A" before their model number (AMD A6, for example).

For those not in the know, an APU is essentially an AMD GPU that's been mated with an AMD CPU. In effect, what you get is a hybrid CPU-GPU combo that offers you something less than the best of both worlds. Take the case of the A10 APU. When pitted against an i5 (in the same price bracket), it offers you the computational power of a Celeron M and GPU power that's about 30% below what you'd get from an NVIDIA 700M. That said, the combination works quite well, especially in GPU-intensive applications, but there are very few other scenarios where you'd appreciate the APU.

Another main drawback of the APU is the tremendous loss in battery life, which is about half of what you'd get with an i5, and easily seven times lower than what you'd get from a Celeron. AMD's E1, which is its low-end APU, is a bad choice for budget laptops however and even though the graphics option (on paper) is better than that on the competing Celeron, no amount of graphical power can compensate for the loss in processing power.

RAM

Apart from the processor, the cheapest and best way to quickly boost a computer's performance is by beefing up its system memory or RAM. Most pre-configured laptops these days offer at least 2 GB of RAM – it's pretty much the standard. We recommend you to upgrade system memory or RAM from the get-go. Don't wait to do so until your system starts getting sluggish a year down the line. If you're having your laptop built to order at a vendor's website, don't hesitate to add extra RAM then and there. If you're buying laptops off the counter at an electronics store, ask for a range that has more than 2 GB of pre-installed RAM. Upgrading to 3 GB or 4 GB may seem like overkill initially, but if you want to hang on to the laptop for a while, that extra memory will be money well

spent and keep your system motoring along longer.

For a budget-conscious customer, stick with at least 2 GB of RAM on your laptop – any lower and we're talking about netbooks, not laptops. For those desiring an all-purpose laptop, a minimum of 4 GB of RAM should be good enough for handling multimedia, entertainment and casual gaming, apart from every-day tasks.

In case of upgrading your laptop's RAM, make sure you double-check the maximum clock timings supported by your laptop's RAM. While buying two sticks instead of one, don't buy RAM from different manufacturers. Stick with only one manufacturer to save a good amount of troubleshooting time. Ideally, buy two identical RAM sticks that share the same manufacturer, clock setting, capacity, etc.



Hard drive

If there's one thing to be glad about personal computing and technology in general today is that storage costs have considerably dropped. Cost per GB is the best it has ever been and it's expected to go down even further in the coming months. This is good news for budget-conscious laptop buyers because it eases their woes a bit. But having said that, opting for a fatter, faster hard drive is still going to eat into your budget and be more expensive than buying a slower hard drive with less space. Settle for a 320GB or 500GB hard drive with a 5,400rpm spin speed – which is still the de facto on most budget notebooks – instead of lusting for that 750GB or 1TB drive spinning at 7,200rpm, unless you really require it.

Don't even think about SSDs. They're unfortunately still out of range for all budget and most all-purpose laptops even today. SSD prices, too, are witnessing significant price drops but they are still

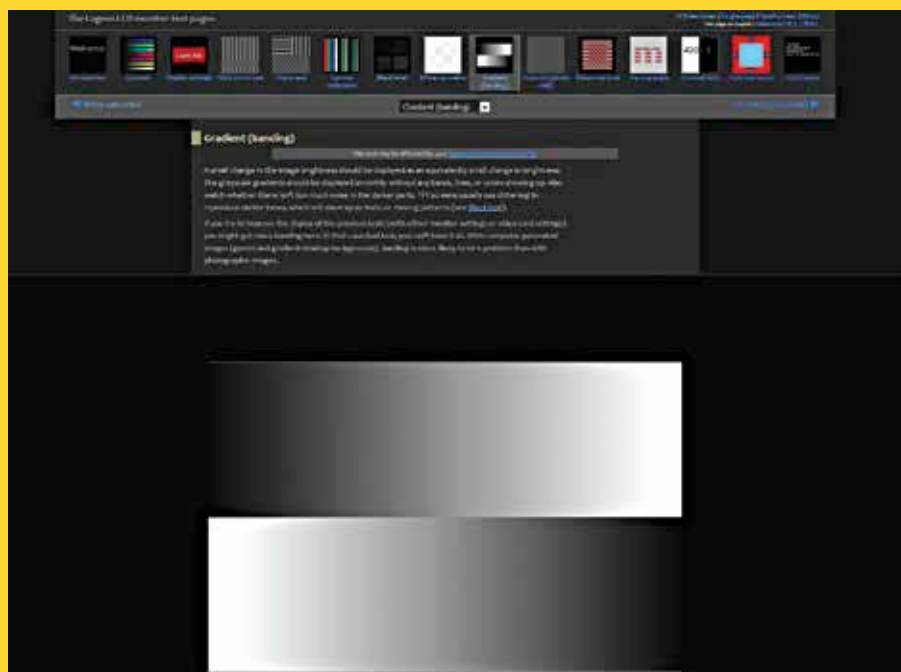


HOW YOU TEST IN A RETAIL STORE

Even if the best deals for all laptops exist online, it's great to make use of offline electronics store to test drive a laptop before purchasing it (or a similar one from its series) online. That way, you're absolutely sure of what you want, and there's no room for second guesses. When in a store, this is what you should look for in a laptop



1 Screen Quality: While a screen's resolution is pretty straightforward and easy to understand, there are other things you should look for, such as its quality. Stand in front of the laptop and tilt its screen back and forth (while keeping your head still). Then, try moving from left to right while keeping the screen stationary. If you notice colour shifts, it's pretty obvious that the laptop doesn't have an IPS display. Colour shifts are entirely dependent on the laptop screen's panel, and while IPS remains the best quality in terms of viewing angles, what you get in a screen depends on how much money you're willing to spend.



3 Screen LCD: If the laptop kept on display in a showroom is connected online, try visiting <http://www.lagom.nl/lcd-test/> through its browser and take the LCD test to determine for yourself how good or bad a laptop's screen is.



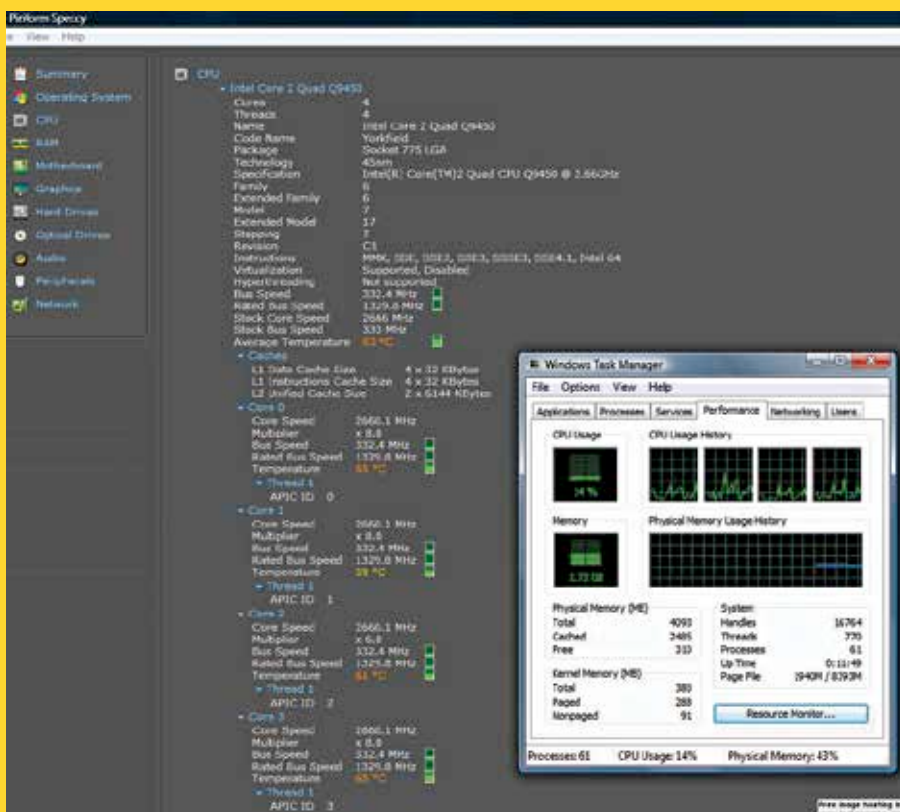
2 Screen Brightness: Test the screen's brightness with a light meter app like 'Lux Meter' (<https://goo.gl/x3U52l>) or 'Easy Light Meter' (<https://goo.gl/85W3Kj>). They should give you a fair idea about the screen's brightness. Obviously, the centre of the screen will be its brightest spot, while towards the edges, the screen will be less brighter.



4 Screen Reflectiveness: You won't be able to tell how bad a laptop's screen reflects light falling onto it until you see it in person. Matte screens are the best, whereas glossy screen surfaces (as found on most modern laptops these days) can be quite annoying to work with, like the example shown here.



5 Audio: Copy some of your favourite songs on a pen drive and ask the sales executive at the laptop demo station to allow you to play your songs on the laptop. Generally, don't expect laptop speakers to be of great quality, as you'd be disappointed.



6 Temperature: If you have an electronic thermometer at home, you can easily test a laptop's max load temperature. Convince the sales guy to let you install 'Prime95' (<http://www.mersenne.org/download/>) on the laptop and select "Just Stress Testing" when prompted on the first run. After about 4-5 minutes, try keeping the thermometer's sensor tip on the heat exhaust vent at the laptop's edge (left, right or back). If the reading stabilises under 60 degrees, you're good. Anything over 65 degrees should ring warning bells. If you can install 'Specpy' (<https://www.piriform.com/specpy>), you can see live temps, and anything in red is a big no-no.



7 Screen Readability: To check whether the laptop offers good readability, we use a very short benchmarking tool, which you can carry on a pen drive and try out on your prospective laptop in an electronics store. 'Pixperan' (<http://goo.gl/Koh1K4>), is a standalone tool that doesn't require installation. After firing it up, the tool tells you your screen's FPS or refresh rate. There are two limitations here: the strength of your eye and the quality of the screen – one of which is going to remain constant (your eye) throughout this test. We generally get a minimum score of 10 or 11 on a below-average screen, and over 15-16 for an above average screen. See how the screens of the laptops at the store perform.



8 Build quality: Pay close attention to the laptop's spine hinges, whether they're tight and of good quality (preferably metal). Make sure the screen doesn't jitter while typing – some vibration is to be expected, but a faint wobbling is a sign of poor build quality. Make sure the laptop has rubber stoppers (not the plastic ones) on its bottom panel for superior grip on all surfaces, glass included. In a 2-in-1 or hybrid laptop, with a 360-degree rotating hinge or breakaway screen tablets, special attention needs to be given to the device's build quality.



9 Keyboard: Laptops can have tightly packed keys, chiclet keys or curved keys. Try typing a good deal on the laptop – especially if it has differently designed keys. Look for a dedicated number pad, placement of [Fn] and [Ctrl] keys, multimedia keys if you need them, etc. If while typing, the deck vibrates and hampers your typing, it's a clear sign that the keyboard isn't good enough.



10 Touchpad: Most laptops these days come with single-slab touchpads without individual, separate left-right mouse buttons to tap on. We think this is less than ideal, but again see what agrees with your fingers more. Textured touchpad surface is generally better than smoother, glossier ones, so keep an eye out for them.



a fancy of high-end performance laptops and premium ultraportable laptops. In a couple of years, SSDs available on a budget laptop, selling for ₹30,000 to ₹35,000 should become a tangible dream, going by the massive price drops in existing storage drives.

Screen

A laptop's display screen still remains a subjective preference. While a 13-inch laptop will suffice for a jet-setting execu-

tive, a 17-inch laptop screen is what an entertainment junkie desires from his desktop replacement notebook. Choosing between glossy or matte screen displays is still a matter of personal preference, but we think a glossy display is best for viewing movies and gaming, while a matte screen is more apt for reading text for extensive hours.

These days, it's difficult to get a laptop that has a 1280x800 pixel resolution – a norm on notebooks, created only a few

years back in 2008. Nowadays, a laptop, whether it's 13 inches or 15.6 inches wide comes with a standard 1366x768 pixel resolution widescreen display and a 16:9 aspect ratio – best for fitting in HD videos, whether they're beamed at 720p or 1080p. So if you're out to buy a budget laptop, you'll be hard pressed to find one which doesn't have a 1366x768 pixel resolution screen – whatever be it's size. However, the choices are a bit wider for someone with more cash to spend on an all-purpose home laptop for entertainment or multimedia use. Some laptop vendors are known to cram in a higher-resolution display in a small screen size – for example, a full-HD 1920x1080 pixel resolution screen in a 15.6-inch frame size. While there are popular intermediary screen resolutions on offer – 1440x900, 1600x900 and so on – you should choose the best bet within your budget. And remember – don't try to get a 1080p resolution screen in a small frame (15-inch), as it can be difficult to read text on native resolution.

Most laptops, in all price brackets, come equipped with a TN panel screen

HOW YOU TEST (LIKE DIGIT AT THE TEST CENTRE)

After buying a laptop and having gone through our retail store test parameters, here's how you can benchmark your laptop when it arrives at your doorstep in pristine condition. Why should you benchmark? Because this is when your laptop's going to be in its best shape ever. Therefore, it's important to catalogue its health and check how much it has faltered periodically (every six months or so). All of these benchmarks and tools are used by us while testing laptops.

- **Futuremark benchmarks:** To strenuously test every aspect of any laptop's core components – which is mainly the CPU, GPU, RAM and hard drive, we run Futuremark's PCMark and 3DMark benchmarks on all our laptops. The Futuremark tests are among the most widely recognised industry standard when it comes to ranking and rating a laptop's performance. Its fully licensed version doesn't come for cheap, but if you want to peg your laptop against others in the world and see where it ranks, this is one of the best benchmarking software you could try out.
- **Spyder Studio 4:** For testing a laptop's screen, we use Datacolor's 'Spyder Studio 4', which comes with a color meter that accurately tests the screen's brightness, contrast ratio, uniformity of brightness and color gamut (among other things). The device sells for ₹45,000 and while we know this isn't something that all of you can afford, it's still a great tool to have to precisely and accurately test your laptop screen's (or any screen's, for that matter) overall quality and health.

- **Battery test:** Our battery tests are conducted at high performance battery preset (from within Windows 8.1's control panel options), with screen brightness and volume set at maximum. For close to a year now, Digit has been using PCMark's internal battery benchmark for standard scores across the board and ease of comparison for posterity, but you can also take a look at Peacekeeper's battery test (it's a browser-based benchmark developed by Futuremark – <http://peacekeeper.futuremark.com>), or BAPCO's 'MobileMark', which is also one of the most widely used and respected battery benchmarks within the industry.
- **GPU benchmarks:** Testing out a laptop's graphics chip is extremely important, especially when a laptop comes with a discrete graphics unit (from NVIDIA or AMD). To thoroughly test out a laptop's GPU, we not only run 3DMark but also MAXON's CineBENCH 15 and benchmarks from games like *Sniper Elite* and others.
- **Diagnostic tools:** To ensure all your hardware is running properly, we have a few tools for your benefit. Check out AIDA64 (<http://www.aida64.com/>) which lets you prepare a detailed hardware report of your laptop's internal components for easy troubleshooting in future. We also recommend using tools like CPU-Z and GPU-Z for keeping tabs on your processor and GPU's vital signs. Also, go ahead and use Speccy (as mentioned earlier), as it comes with a nice little console for temperature mapping all your critical internal hardware.



– none of them let you choose the type of panel you can have on your notebook. As a result, viewing angles of almost all laptops are nearly the same – give or take a few degrees. IPS panel displays are obviously expensive, given their superior quality compared to TN panels.

Another thing to consider while deciding between a 14-inch or 15.6-inch laptop is this: larger a laptop's screen, larger is its overall weight. So pick wisely.

Graphics

Generally, you choose a laptop that has your desired GPU inside, not the other way round. While changing RAM within a laptop is feasible, doing the same with GPUs is another matter altogether.

If you aren't going to game on your laptop and are content with watching regular DVD movies, then the onboard graphics should be enough to cater to your needs. Casual gaming and HD video content opens the door for a discrete graphics card. If you're buying a budget laptop with discrete graphics, we recommend looking at laptops with older generation hardware – NVIDIA GeForce GT 800M and AMD Radeon HD 8000M series graphics equipped laptops are still available in the market, so you should be able to find a really good bargain in an electronics store or on eBay.

Multimedia and gaming enthusiasts looking to max out their credit limit should look at the latest AMD Radeon HD 8000 / R7 2xx or R9 2xx and NVIDIA GeForce GT 800 / 900M graphics series, for gaming with latest generation DirectX 11 games on your laptop's native resolution.

Battery

A laptop's battery life is a matter of personal preference and intended usage – which may vary significantly from person to person. On average, a mainstream laptop with a six-cell battery will last for up to 3-4 hours on a single charge – laptops powered with ULVs or Ultra Low Voltage processors last longer, and netbooks last longest. If you don't expect to go mobile often and intend to use your laptop largely at home, don't bother with a bigger battery and stick with the standard battery bundled with the laptop.

If you'll be taking your machine on the road regularly, start looking at higher-capacity batteries for the next long haul. And don't trust vendors' battery life specs – many of them quote times for their laptops configured with higher-capacity

batteries and with many of the notebook's features turned off (dimming the screen brightness to nothingness and shutting off Wi-Fi, for instance).


Also, realise that a laptop configured with a quad-core Core i7 processor, several gigabytes of fast RAM, dedicated graphics and fast-spinning hard drive is going to eat up its battery at a considerably faster pace compared to, say, a netbook which has a single-core low-powered Atom processor, single GB of RAM and a slow-spinning hard drive. Most modern mainstream laptops these days come with automatic graphics switching built-in – NVIDIA GPUs have Optimus, while AMD GPUs have a toggle switch built into Catalyst Control Center.

But as a rule, you forgo on battery life the minute you start climbing higher up the performance ladder – be it laptops, mobile phones or any other battery-powered gadget.

Keyboard and trackpad

The keyboard and trackpad are also subjective features. However, there are a few ground rules in distinguishing and selecting a laptop with a good quality keyboard and trackpad.

Almost every laptop sold these days sports a keyboard with chiclet-styled, isolated keys. Even among them, a keyboard with curved key design is better for typing compared to flat-top chiclet-keys, simply due to the better ergonomics. Look for keyboards that don't short-change the sizes of important keys like alphabets, [Shift], [Space], [Alt], [Enter], [Tab], [Control] and direction keys. It's difficult to find a dedicated number pad on a 13 or 14-inch laptop, so if you'll be doing a lot of number-crunching on your laptop, opt for one that has a dedicated number pad.

Trackpads are easy to spot. Generally, stay away from trackpads that have a glossy, shiny surface (like the screen cover of a laptop). It makes tracking difficult and doesn't provide optimum feedback to the finger when you move it around on the trackpad. Choose a trackpad with a textured finish, it's generally the best for mouse tracking. Also, make sure that the mouse buttons below the trackpad are separate and well-built. Single-strip mouse buttons can be uncomfortable to use. 





TABLETS

Ever wonder what to look for when buying a tablet besides the budget and screen size? Let us enlighten you

By **Hardik Singh**

Handheld devices are surpassing each other at a very rapid pace in terms of performance, yet they aren't powerful enough to outmanoeuvre laptops and PCs in terms of performance and productivity. Enter the in-betweeners – tablets. While tablets are also not powerful enough to match high performance laptops and PCs, they can certainly outmatch netbooks with ease. Currently, tablets are available in many forms, sizes and prices. While the lower end of the tablet segment is primarily aimed at users buying a media consumption device, higher end tablets deliver on the productivity front as well.

So, how do you go about buying a tablet that meets your requirements? What configuration would suffice your needs? What screen size would you favour? And what about the quality of the display? We've structured a buying guide that should help you figure all this out. You can use the quick hands-on test outlined here on the tablet in the electronic store itself for a fair idea about whether the tablet is worth buying. We've also included a number of tests we ourselves run when we test tablets here in our test labs. You can run these tests on your newly bought tablets to quantify the different components of your tablet.

Display

Besides different displays sizes, tablets can also be classified based on their varied

display types and display resolutions. Once you've assessed your purpose for wanting a tablet, you can then proceed to check whether your favourable display size and resolution is available in the market.

Display size of a tablet corresponds directly to its portability. Screen sizes also determine the size and weight of the device. A larger screen size generally means a heavier tablet. For example, if you need a tablet to check email, read ebooks and catch an occasional movie, a light 7-inch portable tablet can easily serve the purpose. However, if you're looking for a replacement to your laptop, a tablet such as the 12-inch display Microsoft Surface Pro would do the job. Its display

size makes it unfit to be considered for the portable category. However, what you lose on portability, you gain in productivity.

Voice and Data

Another major sought after feature these days is voice calling. This feature can enable you to ditch your smartphone completely. Since most voice tablets offer a larger battery and a larger display to carry out tasks far more easily than on a mobile phone, choosing to use only a tablet makes sense.

In the ever growing need of staying connected, having data capabilities in a tablet comes in very handy. Be it socialising via social media or web calling via Skype, having a data plan is a bigger requirement than voice calling. However, there are users who are satisfied with just Wi-Fi and that's understandable if your lower budget is the reason for that decision.

OS

An operating system is a very subjective choice. If you're merely looking for a media consumption device and don't want to spend a fortune buying a tablet, you can easily opt for Android. If you want to be a bit more productive and require a somewhat similar experience to what you get from a PC, then the OS of choice is certainly Windows. Keep in mind, however, that Windows on tablets is still very choppy but we hope that the problem will be solved with the upcoming



Is a larger tablet better than a smaller one?

HOW YOU TEST (LIKE DIGIT IN THE TEST CENTRE)

After buying the tablet of your choice, you can test it the way we do by following these tests. On performing these tests, you'll be able to get a clearer picture of where your chosen tablet stands among other tablets.

Display

We ourselves start with the same test of checking color shift in a tablet display by using the same methods we suggested in the previous section. We do this test in various lighting conditions as well as at various brightness settings which a tablet may encounter during the course of its lifetime. After that, we use tests like the browser-based lagom.nl and in case of Android devices Antutu's own display test to get a better picture of what the display can achieve. We compare the concluding results with segment toppers at the moment and this helps us to quantify the results further.

Performance

To test the performance of a new tablet we follow the same test regime we employ for smartphones. When the device is fresh out of the box, we load all the synthetic benchmarks we use which are Antutu, Geekbench, PC Mark for Android, 3D Mark benchmarks and GFX Bench. We do these benchmarks tests when the tablet is fresh out of the box since this gives us the most accurate benchmark result the tablet could achieve.

Antutu benchmark gives combined points on the performance. It also features a screen test benchmark which we have mentioned earlier in the display section. Another important number Antutu provides is the number for read and write operations the internal storage can perform.

On the other hand, GeekBench 3 provides a split score for single core and Multi core. These scores when compared to other devices we have tested in the past give us the ground to assess the phone on its multitasking abilities.

GPU tests like GFX bench provide a lot of test result which assess the on-board GPU but the scores we look for are Manhattan and T-Rex tests. However, all these synthetic benchmarks are readily available on the Android platform only with the exception of Antutu

and GFX Bench which are also available on the Windows platform. While none of the above mentioned benchmarks is available for iOS. Thus we move on to real life tests.

We use a tablet generally for more than a week to assess and review the device. In this time we use the device extensively by loading it with apps and using it as a daily driver. There have been instances of devices which would run circles around synthetic benchmarks but would either heat up in day to day tasks or just aren't good enough to handle real world multitasking. If you already own or just bought a new tablet, you can check these methods yourself and assess your tablet.

Camera

For cameras, we follow our standard camera procedure. We click pictures in four lighting conditions – outside in visible sunlight, in yellow light, indoors in fluorescent light and in low light conditions. We take our standard shots of things and a colour chart which are kept in unaltered lighting conditions. These pictures are then transferred to a computer, on which we go into the details of each picture at 100 percent crop to check various distortions the image might have.

Battery

All these heavy duty benchmarking tests and real-world usage takes its toll on the tablet's battery. So, to assess the battery we run an in-house battery test in which we first clear all background activity and then play a 1080p test video with Wi-Fi on and with display on full brightness. We play this for one hour exactly, after which we note down the battery drop. Remember that most good tablets would register less than a 10 percent battery drop in this test.

In case of Android tablets, we also run PC Mark battery test and Geekbench 3 battery test.

Calling capability

Calling capable tablets are checked by making calls. We check if the voice quality is accurate on both ends. We prefer that the other person can hear you clearly even if you're making the call from an environment with a noisy background.

Windows 10. However, if you want a mix of great applications – ranging from games and lifestyle apps to productivity apps – nothing beats the iPad with its iOS. iOS currently provides the most complete app ecosystem in the market with Android very close behind.

SoC

A SoC or System on Chip is the brain of your tablet. These small system on chips generally carry the processor, GPU and radio antennas such as Wi-Fi and cellular among other components. As a rule of thumb, SoCs with quad-core processors or processors with more cores are generally better than dual-core or single core ones. To ease your decision, the current crop of SoCs



Tablet with detachable keyboard

(at least performance wise) has plateaued enough to take care of audio, video and browsing quite efficiently. However, when it comes to resource-intensive tasks like gaming, the difference makes itself evident.

While the SoC you would require is subjective to the task at hand, you can always find out which SoC is better depending on how new it is or what kind of microarchitecture its processor features. Talking about microarchitectures, all major SoC manufacturers use ARM processor architecture. Currently, the performance charts are ruled by NVIDIA's Denver chip which implements a custom version of ARMv8-A architecture. This architecture is capable of running 64-bit applications. ARM's Cortex A72, A57 and A53 also fall in the same 64-bit category. And the Cortex-A17, A12, A15, A7, A5, A9, A8 implement the ARMv7-A architecture which fall in the 32-bit category.

HOW YOU TEST IN A RETAIL STORE

1 Display

If you're out to shop for a tablet in a retail store, finding out the display quality of a tablet is quite easy. The first test you can do is check whether the tablet has an IPS panel or not. IPS displays are currently the best displays around. To do this test, you need to hold the tablet in your hand and without moving your head, turn the tablet and check the display from all possible angles. If you see any colour shift at less than extreme angles, you can be sure that the tablet doesn't have an IPS display.

Since tablet displays are meant to be interactive, you can check how well the touch responsive-



ness is by comparing displays of various tablets in the store. Another point to keep in mind is that protective glass coatings such as Gorilla Glass make the display much more durable. So, try to buy a tablet which has such protective glass coating.

2 Build

If you're buying a tablet from the higher end of the market with a metal construction, you'll be okay. However, most tablets available in the market currently don't offer a



metal construction. To gauge the build quality of such devices, you can move your hand over the entire tablet. This will give you an idea how the tablet feels from different angles. Also, you'll know if the manufacturing process has left any rough edges. Touching it is often enough to observe and distinguish between tacky and cheaper plastic and premium plastic used by different tablet makers.

If the tablet has a removable back, ask the store manager for permission to take it off and do an inspection. You can then know if there are high quality or low quality materials used inside the tablet. You'll also know how strong or flimsy the back cover is. Tactility of buttons such as power and volume rocker are also worth checking before making a decision.

3 Performance

As we mentioned earlier, if your budget is over, say, ₹10,000, you won't find stutter or lags in a tablet as far as media consumption is concerned. However, this may not always be true, and this can be checked by analysing the device further. In a retail store, you can get a general idea how powerful the SoC is by opening up the camera and shooting a video for more than five minutes. If

you find the tablet heating up, it isn't a good sign. This means that the SoC won't be able to keep up with resource-intensive tasks and resident heating issues will heat up the battery.

You can also ask the retail manager if you can connect the tablet to the internet available in the store to run browser-based benchmarks such as SunSpider. And finally, you can test how the tablet handles apps open in the background by opening as many apps that come preinstalled on the tablet.

4 Battery and Camera

While most tablets will offer a larger battery than what your smartphone, you won't be able to test by yourself how many hours the specific tablet will last you by any test



while standing in the store. However, there's a trick by which you can get an rough estimate of how long the battery pack lasts. Since in a retail shop, devices are put up on display, you can easily tap into the battery settings and check how much battery various processes are taking. In latest Android tablets, you'll get a graph as well showing how the battery is being used and by which processes.

Processing power of an SoC is further quantified by the number of cores of a certain microarchitecture it holds. This means a quad-core processor with Cortex-A53 CPUs will offer better performance over an octa-core processor with Cortex-A7 CPUs. However, this is still very complex with the range of custom architectures available from Qualcomm, NVIDIA, Samsung and Apple.

RAM

The more the RAM, better the multitasking abilities. This law is relevant for almost all computing devices across the board, be it PC's, smartphones or the one we are inter-

ested in currently, tablets. While day to day multi-tasking can be handled easily by 1GB of RAM, a 2GB or more RAM is suggested if you want anything more than that from your tablet. Currently most budget tablets come with atleast 2GB of RAM as standard. You will certainly get more RAM in a few tablets as you go higher up the price ladder. However, unlike smartphone RAM which are now touching 4GB, tablets are currently capped at 3GB.

Keyboard and I/O

The on-screen keyboard of a tablet would certainly be better for typing than typing on your smartphone, and in some cases

good enough to type for fairly long periods. However, if you really want to get some work done, nothing beats a physical keyboard. All three major operating systems you will find on a tablet offer keyboard support via bluetooth, though it can vary from manufacturer to manufacturer. However, Microsoft Windows powered tablets may have an edge over the other two operating systems here as most tablets running the Windows OS generally bring along a physical keyboard as an optional extra. On the other hand if you are planning to invest in a iOS or Android powered tablet, don't worry, there are numerous third party keyboards available to suit your budget. **4**

worldview

OUR PICK OF THE BEST TECH ARTICLES FROM AROUND THE GLOBE

(MUST READS)



SILICON VALLEY'S 'STARTUP CASTLE'

It's a self-proclaimed "community of excellence" located in a 17,000-square foot mansion in Woodside, California, just minutes from Stanford's campus. You can't get in if you watch more than 4 hours of TV/movie/game entertainment per week, have more than 1 tattoo, or have ever attended more than 1 protest rally. We're not making this up.

<http://dgit.in/strtcastl>

THE ENIGMA OF SATOSHI NAKAMOTO

In early 2009, someone using the name Satoshi Nakamoto started the Bitcoin story. Then, in 2011, just as the Bitcoin phenomenon went mainstream, Satoshi was gone, but the stories grew larger.

<http://dgit.in/satshink>

IT'S OFFICIAL: GOOGLE GLASS IS A DUD

Google Glass gave Google a black eye in the minds of consumers, cost the company a lot in the way of consumer confidence, and tainted the market for consumer glasses. Read this incisive story chronicling the debacle:

<http://dgit.in/brknglass>

JUST ANOTHER INCREMENTAL UPGRADE?

Apparently not. The iPhone 6s is slated to be significantly better than its predecessors and is said to feature twice the RAM, a significant processor upgrade, better camera, new colour options, sapphire display, strengthened shell and more.

http://dgit.in/iPhone_6s

[Ars Technica Corner]

CORTANA FOR ALL



Hi, I'm Cortana.



Microsoft plans to put voice recognition behind anything and everything, making computer vision, voice, and text processing a mere web request away. Find out how (hint: Project Oxford):

<http://dgit.in/byesiri>



3D microbatteries

As we all know batteries is one area where miniaturisation hasn't kept up with industry standards. But there's hope! Holographic patterning was recently used to create 3D microbatteries that are just 2 mm wide and 10 micrometers thick.

<http://dgit.in/3dbatt>



Digital criminals aren't smart IRL

While this suspected drug dealer might have been smart online, his little slip-up in real life led to his capture. Find out how his IP was found out because of his habit of obsessively using the package tracking feature (not packet tracking).

<http://dgit.in/catchifcn>



Hardware to run the Oculus Rift?

With the consumer launch officially slated for early 2016, Oculus has announced what PC hardware it recommends for a quality VR experience. You'll need a good GPU to push 2160x1200 at 90Hz for one thing. Find out more here:

<http://dgit.in/riftmin>

MEET THE WORLD'S CHEAPEST COMPUTER

Dubbed C.H.I.P., it's slimmer than a

credit card, is capable of browsing the web, editing documents, and playing simple games. How much does it cost? Just \$9! Is the era of Raspberry Pi over? <http://dgit.in/cheapchipp>

BREAKING THE COSMIC SPEED LIMIT

Science fiction has created "warp-drives," "hyperspace," "subspace," and other tricks that have become so commonplace that we don't give them a second thought. However, Robert Scherrer, Professor and Chair of Physics and Astronomy at Vanderbilt University, believes it is far from reality. <http://dgit.in/rvderyet>

WHAT MAKES US UNIQUE?

Genetically identical fruit flies raised under the same conditions are helping scientists create a biological map of what makes individuals unique. Scientists found their behaviour varied much more than expected. Are we all a consequence of randomness then? Read more here: <http://dgit.in/definemee>

THE LAWS OF SPACE NOT PHYSICS

The international community has actually come together and written regulatory guidelines for space exploration and laws that keep the final frontier from turning into the Wild West. If it weren't for these laws imagine what we petty humans would've done to the great beyond? <http://dgit.in/emptylaws>

The 11 most useful Chrome extensions you should install

Here's a list of useful extensions that will help you make Chrome into much more than a simple Web browser.

– By Nikhil Pradhan

Over the past year or so, you must have noticed how important the Chrome browser has become in your daily life, both at work and home. Even if you don't use Chrome or an Android phone, chances are those around you, do. Chrome currently has a grasp on about 25% of the desktop browser market, second only to the behemoth that is Internet Explorer.

As Chrome expands its user base, it has also gained the attention of multiple developers who have created thousands of handy extensions that greatly increase the utility, usability and scope of what the browser can do and what you can do with it.

Here are 11 such extensions that do exactly that. Blip these pages to get shortlinks.

1 The Great Suspender

The biggest complaint that users have with Chrome is that it's a memory hog and even if you're the biggest Chrome fan on earth, you can't ignore that particular issue. This becomes a much more serious issue if you are a tab hoarder, i.e. you always have more 10 to 15 tabs open all the time, and your system always feels slow because of Chrome.

The Great Suspender is an extension that suspends tabs that you've not used for a predetermined amount of time (by default, that time is set to 1 hour) and clears up system memory. I've been using The Great Suspender for about two weeks now

and thanks to the extension, it literally feels like I have a less crappy office PC.

2 uBlock

You don't need me to tell you that using an ad blocker makes large portions of the Internet infinitely easier to bear. While Adblock Plus (ABP) is the most popular ad blocker extension for Chrome, it's also quite heavy in terms of memory usage. There's also the deal with ABP's whitelist, a list of ad sources that the extension doesn't block by default because it deems them 'acceptable' and 'non-intrusive'.

3 Pocket

Sure, Chrome has a built-in bookmarks manager but the less said about it, the better. Instead, try out Pocket, a popular extension that you can use to quickly save pages for reading later. One of the best features of Pocket is that it offers a tagging system that lets you quickly add tags to saved pages. This really helps in keeping your library of saved pages organised and I've been using it, when writing longer stories for Digit, to keep track of my research.

Pocket also has an app for both iOS and Android which means that you can access (and save to) a central repository of saved content both on your phone and desktop.

4 LastPass

Chrome's save password feature may help you easily remember passwords for

different websites but it doesn't offer much in terms of practical security. Theoretically, the passwords database in Chrome is protected by your Windows user account password, but how many of us actually put any thought into our Windows passwords?

LastPass has been around for a while and offers a much more secure way to store all your passwords. LastPass prompts you every time you register on a new website, allows you to pick from lists of randomly generated strong passwords and lets you quickly log into any website with the click of a button. All you need to do is to remember one master password.

LastPass also has apps for iOS and Android but if you want to use the service on your phone, you'll have to pay up.

5 Google Art Project

Google Art Project may not be a particularly useful extension but it does do wonders to improve the way Chrome looks. If you've installed the GAP extension, every time you open a new tab, you will be greeted by an art masterpiece from great artists like Vincent Van Gogh and Shin Yun Bok. Nothing like a little bit of culture to start your day.

6 Momentum

Momentum, like Google Art Project, is an extension that changes the way a new tab looks in a positive way. However, unlike Google's extension, Momentum shows



THE CASE FOR VIOLENT VIDEO GAMES

Americans have long been drawn to the idea that violent movies or video games can provoke actual delinquency or serious crime. The columbine incident didn't help dispel this either since both students involved were huge fans of Doom. But there's hope. Read on to find out why violent games might actually be good.
<http://dgit.in/keelemall>

HOW TO APPEAR SMARTER ON EMAIL

Did you know your email writing, sending and ignoring skills are just as important as your copy-pasting skills? Of course, we're kidding and so are the guys at thecooper-review.com. Follow this link for 12 email tricks that'll help you appear smart the next time you write a letter:
<http://dgit.in/totallyagree>

NISSAN'S 1250 HP MONSTER



When it comes to manoeuvring a superfast (200 mph+) racecar, auto engineers tend to prefer rear-wheel drive for handling and weight distribution. Nissan's new GT-R LM Nismo may turn that notion on its head. Find out how it was built:
<http://dgit.in/gofasta>

IS REDDIT TRYING TO UP ITS ACT?

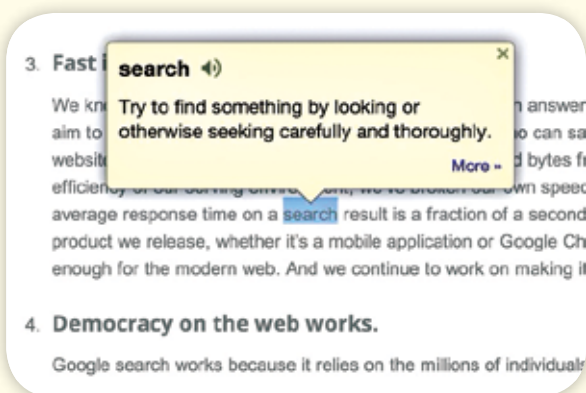


Other than broadly geek-approved tenets like "Privacy is good" and "We like net neutrality", Reddit has never been overtly concerned with being "proper". It's where GamerGate and The Fapping started. So when Reddit released its "core values" manifesto, many wondered what was going on.
<http://dgit.in/cleanditt>

photographs and quotes instead of artwork and also displays some information such as weather, tasks and favourite links. Momentum also gives you some freedom in customizing the way you want your new tab to look.

7 Google Dictionary

As Google Art Project showed, Google has also built some great extensions for its Chrome browser. One of them is Google Dictionary, a handy tool that quickly gives you a definition for any word you may find on a website. After you install the extension, when you come across a word that you want to define, just double click the word and you'll get a small yellow pop-up with the definition. If you want a more comprehensive definition, then just click the extension icon next to the Chrome URL bar.



Google Dictionary extension at work.

The Google Dictionary extension also serves as a reference guide and can give you definitions and explanations for any proper nouns, abbreviations etc., as well.

8 PushBullet

PushBullet is one of the handiest extensions that I've come across. What it does is push notifications that you get

on your phone to your desktop so that you don't have to look away from your PC every time you get an SMS or a Whatsapp message. You can mute these notifications and act upon them to a degree based on the app sending the notification. For instance, if you get an SMS or a Whatsapp message, you can reply right from the desktop notification; on the other hand, if you're using a third party email app, you can mark emails as read or just mute the app altogether. You'll also get notifications about the songs currently playing on your phone, something I personally find very handy.

To use Pushbullet, all you need to do is install the extension in Chrome and install the app on your phone. The rest should take care of itself.

9 ProxMate

While Indian Internet users can access a huge swathe of the Web, there are certain sites and services hidden behind geographical restrictions. ProxMate ensures that if you're a Netflix or a Spotify fan from our shores, you can access them without issues. ProxMate works a little bit differently than other VPN services because it requires you to install modules for individual services and websites you want to access. Once you do that, you should have no problem listening to the latest music on Pandora and Spotify or watching the latest episode of Daredevil on Netflix.




Install Pushbullet to forget your phone for a while

10 Hola

Hola, like ProxMate, is a VPN extension that lets you access geographically restricted content on the Internet. However, unlike ProxMate, Hola works without installing any modules and you can use it to access sites immediately.

The downside to Hola is that it may result in a security or privacy risk for you because of its P2P nature. As a result, it lets other users utilize your connection to access content blocked in their respective countries. I'd personally suggest you use ProxMate unless you're okay with the risk that using Hola entails for the 'one-click' ease it brings.

11 Streamus

Staying true to the adage, "Save the best for last", I give you Streamus, a Chrome extension with a neat, streamlined interface that lets you listen to music from YouTube videos without actually opening YouTube or playing the video. Streamus also lets you create playlists and save them, which means that this is one extension that everyone should have installed. 

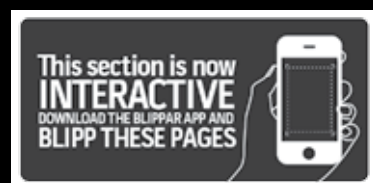
CYRIAK

If you are falling short on your daily dose of insanity you have to follow this channel. Where else will you get



to see dancing cows turn into spiders set against some trippy electro tunes?

<http://dgit.in/lsdnotneeded>



For a list of all the links from this section, head over to <http://dgit.in/WVJune2015>

(PRODUCT LAUNCHES)

ITYPE SMARTWATCH



If successfully funded, this could be the first smartwatch on which you can actually type. Said to be built around an A7 Processor, the iType will have 1G RAM and 8G ROM. Of course there's Wi-Fi and SIM card slot thrown in with a camera. Price: \$235.

BLACKBERRY LEAP



A full touch phone it features a 5-inch 720p display. It sports 8 MP auto-focus rear camera and 2 MP fixed-focus front camera. It is powered by a 1.5 GHz dual-core Qualcomm processor along with 2GB of RAM. Priced at ₹21,490, it has 16 GB of ROM.

YOTAPHONE 2 (WHITE EDITION)



The YotaPhone 2 recently underwent a refresh getting a few upgrades. The speciality of the phone remains the same – its battery saving always-on grayscale e-ink screen at the back. The front has a 5-inch AMOLED screen and runs on a 2.2 GHz quad-core processor.

PICTURE PUZZLE



ABSOLUTE
TIMEPASS

UNJUMBLE
ON YOUR MOBILE



DOWNLOAD BLIPPAR APP ► FILL SCREEN WITH IMAGE ► BLIPP IMAGE INTO LIFE!

Top 3 YouTube Picks

Make sure your boss doesn't catch you goofing off with one of these videos playing on your screen



Two lunatics. Two jetpacks.

Duration: 11 mins 52 seconds

Jetman Yves Rossy and his protege, Jetman Vince Reffet fly over Dubai. Watch the flight in 4K glory.

<http://dgit.in/jetpkss>



The Fermi Paradox

Duration: 06 mins 03 seconds

Why don't we see any aliens? And more importantly, what does this tell us about our own fate?

<http://dgit.in/fermipdx>



Pure destruction

Duration: 03 mins 42 seconds

Watch a front loading washing machine destroy itself. Why? Well why the hell not?

<http://dgit.in/fullload>

Bazaar

THE LATEST PRODUCTS REVIEWED FOR YOU

The Digit Test Centre receives hundreds of products every month. Each of these products is put through a series of tests and is finally given a score. The final score is arrived at after considering a number of factors and evaluating them in terms of features, performance, value for money, build quality, and, in the case of software, even ease of use.

For better understanding of our ratings, here's a quick guide to our overall score

- 10 to 30** **Extremely poor product.**
Keep away!
- 31 to 50** **Strictly OK.**
Not recommended
- 51 to 70** **Decent product.**
Go for it, but there may be better products out there.
- 71 to 90** **Very good product.**
Highly recommended.
- 91 to 100** **Ground-breaking product.**
We've never seen anything like it before.
A definite must buy!

Page **103** ▶
Samsung Galaxy
S6 Edge



◀ Page **104**
Bose
SoundLink III



Page **105** ▶
Lenovo ThinkPad
X1 Carbon



▲ Page **106**
ASUS ZenFone 2



▲ Page **111**
ECS LIVA X
Mini-PC



▲ Page **112**
Xiaomi Mi Band

& MORE...

**INTERACTIVE
REVIEWS INSIDE!**
KEEP AN EYE OUT FOR
THE BLIPPAR ICON



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▶ FILL SCREEN
WITH IMAGE

▶ BLIPP IMAGE
INTO LIFE!



Wind turbines without blades!

A Spanish Company called Vortex bladeless has proposed a method of harnessing wind energy in a new way. Read more: <http://dgit.in/1HmZr8x>



Microsoft to buy Blackberry?

Reports of Microsoft acquiring Blackberry are making the rounds again. <http://dgit.in/1bZIXYD>

HTC Desire 826

Jack of all trades, King of none



The HTC Desire 826 is pretty similar in terms of design and build quality to other HTC Desire phones we have seen recently. It has a plastic build which combined with the slippery back is not very reassuring. But so, there is no denying it that the 1080p 5.5-inch display is one of the best 1080p displays in its segment. The display is bright and easily visible under direct sunlight. Coming to the UI, The new Sense UI 6 offers a theme manager over Sense UI 5.

Going over the performance, the phone had no issues handling day to day tasks or even graphically intensive games. But per-



Price
₹25,990



Feature	84
Performance.....	74
Value	64
Design.....	74

Specifications

Display: 5.5 inch display with 1920 x 1080p resolution (401ppi); **Battery:** 2600mAh; **Storage:** 16GB; **Camera:** 13MP rear with LED flash, 13MP front; **SoC:** Qualcomm Snapdragon 615; **CPU:** 1.7GHz Quad-core + 1.0GHz Quad-core; **RAM:** 2GB; **Operating system:** Android 5.0.1; **Connectivity:** 4G, Wi-Fi, Bluetooth, Dual-SIM

Contact

HTC India
Phone: 1800 266 3566
Email: <http://dgit.in/1y5V50h>
Website: www.htc.com/in

longed usage made the phone heat up and made it uncomfortable to hold. Simultaneously, speed throttling would kick in and one could see lags and stutters creeping in. Battery performance is also not up to the mark either and performs below my expectations.

Like the Desire 820s we expected a good camera but that isn't the case with the Desire 826. Each and every picture I took with the camera showcased the same problem - over-saturated colours and lack of focus. And when the camera did focus, I found the contrast levels higher than expected. In conclusion, the HTC Desire 826 is not the best phone in its category and exists only as an option like every other Desire phone from HTC.

Hardik Singh

ECS Z97I-DRONE

Good things come in small sizes



Price
₹8,995
(+Tax)

When it comes to Mini-ITX motherboards there are very few ways you can squeeze in all the requisite features onto the limited real estate. Often, we can see close similarities between different manufacturer's approach towards component layouts. For example, Gigabyte and ASRock follow very similar layout styles. The same can be said for ECS and MSI. ECS' Z97I-DRONE is one

of the few Mini-ITX motherboards that one can find in India. It doesn't

have an elaborate heatsink like some of the other boards but the one on the board is sufficient for the 5-power phases that it has.

Mounting a Mini-ITX board can throw up some issues with regards to cable management since the CPU ATX power connector and the SATA data cables are situated at the top left section which is generally farthest from the drive cage in cabinets. But these things are a non-issue since cases designed for Mini-ITX boards follow a top-down cabling approach. So SATA slots pointing upwards are actually preferred. Competing brands generally provide a Wi-Fi / Bluetooth PCIe card with antennae mounts on the board itself for a price bump. The Z97I-DRONE gives you the freedom of picking a Wi-Fi/BT of your choice and mount it on the M.2 slot. Unfortunately, this slot doesn't support storage media. On a side note, we found that the motherboard's documentation has instructions in Hindi, a welcome move.



Features	53
Build	76

Specifications

Chipset: Intel Z97; **Memory support:** 2x3000MHz upto 16GB; **LAN:** Intel I218-V Gigabit Ethernet; **Audio:** ALC1150 7.1; **SATA:** 5x SATA III; **Expansion:** 3x PCIe X16(x16+x16+x8); **Dimensions (LxWxD):** 170 mm x 170 mm; **Warranty:** 3 years.

Contact

Elitegroup Computer Systems Co. Ltd.
Phone: +91-9820357713
Email: bhattrajshekhar@ecs.com.tw
Website: www.ecs.com.tw

Mithun Mobandas



An Apple with windows!

A computer science engineer reported that his Macbook Pro worked better with Windows 10 instead of OSX. <http://dgit.in/1Agf0yU>



Beast for Beast

NVIDIA announced launch of the 352.86GE Force driver for upcoming game The Witcher 3: Wild Hunt Title: <http://dgit.in/1A9WNDC>

Bazaar

Samsung Galaxy S6 Edge

The bleeding Edge

To say that the Samsung Galaxy S6 Edge is a looker would be a massive understatement. There's nothing like it in the market right now. The LG G Flex 2 may be curved, but it really catches your eye from certain angles. It's not the same with the Galaxy S6 Edge. It's sure to turn some heads.

I'm not a big fan of the glass on all sides, because it means there's that much more to break. Smartphones are usually the strongest on their sides, but that part of this phone is covered by the edge display. But then again, you're going to be extra careful with a device that costs Rs. 58,900 anyway aren't you?

I won't say that this is the sturdiest device out there, but it's as premium as it gets. If Samsung's goal was to take on the premiumness of the iPhone, then the S6 Edge is the one to pit against it. Not the Galaxy S6 mind you, the S6 Edge.

Samsung makes the display feel and look so much better than anything out there. Yes, I can see Apple fans arguing about the benefits of Retina, but really, the Super AMOLED here is without a doubt the best display on a compact smartphone today.

As always, the colours are on the warmer side, but 577 ppi coupled with amazing viewing angles, thanks to the Edge, makes this the best smartphone display today.

While there are quite a few pre-installed apps on this phone, it would be wrong to categorise apps like WhatsApp and Microsoft's OneDrive etc. as bloat. Do I wish I could uninstall what I wanted? I sure do.

I don't really have a problem with Touchwiz as an UI, but a lot of the things can be seen as useless. Flipboard takes over the screen that is handled by Google Now on the stock launched, but it is nowhere as seamless. It's not stitched into the launcher, like HTC's Blinkfeed. Hence, swiping over to that screen will stop your phone for a second or two while Flipboard boots up. The Edge display on the S6 Edge though is a gimmick.



Price
₹57,399



There's no separate panel here, it's simply one panel with curved glass, which severely reduces the functionality. There's not much that you can do with the edge, except some quick calls and different colours for some preset callers. While the Edge adds a lot to the phone's looks, it doesn't bring much by way of functionality.

Its processor is right up there on performance.

The phone doesn't seem to throttle the processor very easily, even though it does heat up fast. Over extended periods of gaming, the S6 Edge doesn't seem to throttle the processor for at least the first 15 minutes. Even after that, the effects of throttling aren't as apparent as they would be on most

other smartphones. If you're a big gamer and play high-end games on your phone, you would love using this.

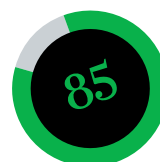
Despite the performance though, what you buy it for is the 16MP rear camera. The rear camera is the true hero of this device. It's one of the fastest cameras out there and takes brighter images than the iPhone 6, along with better details.

On a 2,600 mAh battery and a QHD display, we never expected the Galaxy S6 Edge to be a battery beast. On a normal day's usage, the S6 Edge lasted us just about the full day. With about an hour of gaming, lots of calls and texts, and boat loads of camera usage, this phone couldn't last us the entire day, but it did get us through when we curbed the gaming. Fortunately, it has the fastest of fast charging batteries.

If Samsung's goal was to take on the iPhone 6, then this is the phone to pit against it. The Galaxy S6 Edge outperforms the Apple iPhone 6 in both performance and camera departments, which is something no Android phone can boast. If you're looking for a flagship smartphone to buy, the Galaxy S6 Edge should definitely fit the bill.

What it doesn't do is offset manufacturers like Xiaomi, who will still enjoy their popularity in the budget segment.

Prasid Banerjee



Design 84
Performance..... 92
Features 88
Value 76

Specifications

Display: 5.1 inch QHD Super AMOLED;
Processor: Exynos 7 Octa;
RAM: 3GB; **Operating System:** Android Lollipop;
Camera: 16MP rear, 5MP front; **Battery:** 2600 mAh

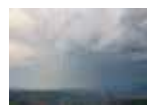
Contact

Samsung India Pvt Ltd
Phone: 1800 3000 8282
Email: dgit.in/14mUv1K
Website: samsung.com/in



Fujifilm unveils the 'past'

Fujifilm has launched the X-T10, which looks every bit a vintage camera, and easy on your wallet, too: <http://dgit.in/1FsPqsK>



Fun Fact

One can toast 1,00,000 pieces of bread from the energy of a single lightning bolt. <http://dgit.in/1IGIpVX>

Bose Soundlink III

Power at a Price



"warm" and "rich". The speaker has a definite bias towards the lower-end of the spectrum but unlike many other similar speakers, it manages to combine punch and

expansiveness. When it comes to acoustic tracks,

I found that although the vocals were clear and distinct, the instruments tended to disappear into the mix. When it comes to genres like metal and rock in which songs tend to have many instruments in the mix along with the vocals, all of which demand focus, the Soundlink III falters. While the bassline and the primary vocals stand apart, the vocal harmonies and guitars get drowned in the mix.

To sum it up, the Bose Soundlink III is a very loud speaker that does justice to music with a bass focus and limited instruments but has some problems when it comes to other genres.

The Soundlink III's battery was also able to last for 15 hours before switching off automatically.

There's no denying that the Soundlink III is a quality product with impressive performance but there's also no way to ignore its price-tag. If you don't want to spend as much and are okay with a slight dip in power, look at the excellent Creative Sound Blaster Roar. If money is not a concern, then the Bose Soundlink III won't let you down.

Nikhil Pradhan

Price
₹22,400

The Bose Soundlink III looks understated and utilitarian which, at 1.3 kgs, is relatively heavy as well. Overall, the Bose Soundlink III is well-built and has a very business-like design that's all about functionality and utility.

This is a loud speaker, in fact, one of the loudest that I've reviewed, and it stands right alongside the much larger House of Marley Get Up Stand Up. When you start playing music over the Bose, the adjectives you'd use to describe the sound quality are



Performance.....	78
Build & Design.....	62
Features.....	76
Value for money.....	65

Specifications

Bluetooth Support: A2DP (stereo); **Controls:** Volume, Mute; **Internal Battery:** Yes; **Battery Type:** Rechargeable; **Weight:** 1.2 kgs; **Warranty:** 1 year

Contact

Bose India
Phone: 1800 112 673
Email: NA
Website: www.boseindia.com

HTC Desire 820s

Desireable but not desirable enough

HTC is one of the few companies which has its own distinctive design language and it shows in the Desire 820s. The dual-tone colour setup gives it a very distinctive look among its competition, and you definitely can't miss it in a crowd of good looking gadgets. From a build point of view the smartphone's slim profile and the slippery back may require users to purchase a cover. That said, the phone felt sturdy enough during my use and will do just fine if you are careful with its handling, and not doing any funny business.

The 5.5-inch HD display on the phone is good and also gets Gorilla Glass 3



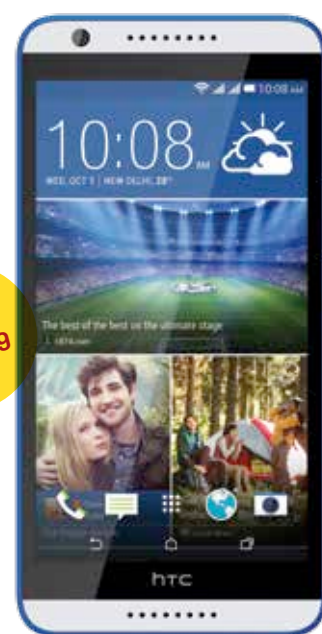
Feature.....	83
Performance.....	72
Value.....	86
Design.....	70

Specifications

Display: 5.5 inch display with 1280 x 720p resolution (267ppi); **Battery:** 2600mAh; **Storage:** 16GB; **Camera:** 13MP rear with LED flash, 8MP front; **SoC:** Mediatek MT6752; **CPU:** 1.7GHz Octa-core; **RAM:** 2GB; **Operating system:** Android 4.4.4; **Connectivity:** 4G, W-Fi, Bluetooth, Dual-SIM

Contact

HTC India
Phone: 1800 266 3566
Email: <http://dgit.in/1y5V50h>
Website: www.htc.com/in



Price
₹20,079

Protection, although sunlight legibility could have been better. Coming to the UI, it's business as usual with HTC Sense 6 laid over Android 4.4 Kitkat. One can see small bits of HTC's custom touches here and there but otherwise it's a clean and true to stock interface. Powered by a new gen 64-bit Mediatek MT6752 SoC, the phone felt fast and responsive even under heavy gaming.

The Desire 820s has one of the best 13MP shooters I have seen in a while. The colour saturation, vibrance and fidelity is top notch. The 2600mAh sealed-in battery is good as well. If you look beyond its design, display and camera, the HTC Desire 820s is an average performer with decent battery life. It might not be the chart-topper I had hoped for but it does take up the challenge quite well.

Hardik Singh



Chevy swag

The next gen Camaro - 455 bhp with a 6.2 litre V8 under the hood. And that's not all: <http://dgit.in/1Fn5M4e>



Freeze!

The scientific term for brain freeze is 'Sphenopalatine Ganglioneuralgia.' <http://dgit.in/1EdLZiF>

Bazaar

Lenovo ThinkPad X1 Carbon

The ultimate business laptop?

The ThinkPad X series of laptops have been known to be thin, light and rugged since their inception, and we've pretty much tested and reviewed every major X series milestone through the years. The latest ThinkPad X1 Carbon continues in that fine age old tradition, carrying the torch of fine craftsmanship into another year. Or does it?

The latest generation of Lenovo ThinkPad X1 Carbon looks strikingly similar to its predecessor launched quite a while ago. The screen lid is made of carbon fibre and glass fibre giving the machine its surprisingly low weight, despite its 14-inch form factor, and the magnesium alloy surface is also a bit sleeker to shed excess milligrams. The whole unit weighs just 1.3 kg which is absolutely fantastic to carry around. However, compared to the more wholesome ThinkPad T series machines or its competitor the Apple MacBook Air, the X1 Carbon feels a bit more fragile, especially around its screen. Having said that, the laptop's survived numerous trips inside a tightly packed Mumbai's local train compartment and passed unscathed. It may look flimsy and dull but it's built to last for sure.

The X1 Carbon's keyboard and trackpad continues to impress. We like the new scalloped or curved keys on its keyboard deck, with just the precisely right amount of dip and travel, offering one of the best typing experiences on a laptop, definitely better than the YOGA 3 Pro we reviewed last month and the Dell Latitude 7250. The trackpoint navigation is as great as ever, guaranteed to convert you from using its traditional touchpad - which is plain jane, devoid of dedicated mouse buttons. Just one disappointment on the backlit, spill resistant keyboard - Lenovo still continues to keep Function as the leftmost key on the bottom left, instead of Control, and that's just irritating to get adjusted to.

As far as its screen goes, the X1 Carbon has a 14-inch IPS display with 2560x1440 resolution and multitouch support. The screen's adequately bright at 218.1 cd/m² similar to the brightness on the HP EliteBook 1040, and more bright than the Dell Latitude 7250's screen. Having said that, its contrast ratio is disappointingly low. Under direct ambient light, the screen does reflect light and until

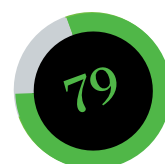


you learn to look past it it's a nuisance, but the screen's sharp and pretty good for watching movies or reading text, and its viewing angles are impressive -- so is its touchscreen experience. Onboard audio isn't great, just about okay for personal entertainment, but the 720p webcam's pretty good for video conferencing through Skype or Hangout.

As far as performance goes, with a low-voltage 5th generation Core i7, 8GB of RAM, and 256GB SSD, everything opens in a snap on the ThinkPad X1 Carbon. Routine business applications - MS Office, Video Calls, other multimedia apps - open uncompromisingly fast, and there's no room for complaint with the X1 Carbon's day-to-day performance. Where the Carbon really shines is in its battery prowess - we clocked 5 hours 9 minutes on our battery benchmark on high performance battery mode, full screen brightness - all thanks to the Intel Broadwell CPU and chipset. On a more conservative battery plan, we have no doubt this notebook can go past 7 or even 8 hours of battery life, and that's fantastic from a businessperson's perspective. At 54 degrees on full load, it's one of the coolest notebooks we've tested.

As is the case, the bundled apps and software on a ThinkPad are never really bloatware, and here too we find ThinkVantage (for maintenance) and other essential apps (for backup, recovery, etc) on the Carbon that makes it more appealing to businesses. Overall, definitely the best performing business laptop we've tested this year, and recommended to anyone who can afford it. If it was priced around 1.5 lakhs, it would've been a more appealing deal.

Jayesh Shinde



Features	80
Performance.....	83
Design	86
Value	65

Specifications

Screen: 14-inch IPS LCD touchscreen, 2560x1440 resolution; **CPU:** 2.4 GHz Intel Core i7 5500U; **RAM:** 8GB; **SSD:** 256GB; **GPU:** Intel HD 5500; **Weight:** 1.3 kg; **Fingerprint sensor:** Yes; **Wireless:** Wi-Fi 802.11ac, Bluetooth 4.0; **Connectivity:** 2 x USB 3.0, HDMI, proprietary Ethernet port + dongle, mini DP, OneLink dock; **Warranty:** 3 years

Contact

Lenovo India Pvt Ltd
Phone: 1800-3000-9991
Email: lencare@lenovo.com
Website: <http://lenovo.com/in/en>



3D printing for animals!

An injured turtle gets a 3D printed beak to help with feeding. Read more: <http://dgit.in/1HpuMdq>



Steve Jobs once more

The trailer for the upcoming movie 'Steve Jobs' starring Michael Fassbender is here! Read more: <http://dgit.in/1EWfAyy>

House of Marley Get Up Stand Up

House of Bass

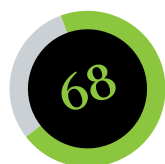


Interactive review

Price
₹36,000

The Get Up Stand Up has a rich dark brown wood finish on the front and an eye-catching design. It's quite large and takes up about the space of a small picnic cooler. The drivers are a little too close together and leads to a performance issue that I will talk about later. Overall, it is a fantastic looking product.

The speaker gives undue importance to bass at the



Build & Design	83
Performance	64
Features	69
Value for Money	56

Specifications

Frequency Response: 20 Hz to 20 kHz; **Bluetooth:** A2DP/APTX; **Input:** 1x 1/8" (3.5 mm) stereo auxiliary input 2x RCA auxiliary inputs; **Woofer:** 2x 4.5" (114 mm) drivers; **Tweeter:** 2x 1" (25 mm) drivers; **Weight:** 7 kgs

Contact

House of Marley
Phone: NA
Email: <http://dgit.in/1ccyMjx>
Website: www.houseofmarley.in

cost of other elements. The bass output is powerful and combined with the high volume ceiling, the speaker can easily fill up a regular flat with sound. Unfortunately, the bass often comes across as unfocused and loose without the necessary precision or thump. Also, like with most modern bass-focused audio gear, the lower end bleeds into the mids and helps muffle vocal tracks when there are a lot of instruments in play. However, if you listen to a lot of acoustic tracks, I think you will be quite satisfied.

As I mentioned earlier, the placement of the drivers is an issue. There is a soundstage and stereo separation issue that comes up due to the large, high-powered drivers kept too close to each other. If you look beyond the clarity and volume, there's nothing really exemplary here.

The House of Marley Get Up Stand Up is priced at ₹36,000 which is just too much. If you don't want to spend as much checkout the Marshall Stanmore or the Harmon Kardon Aura instead.

Nikhil Pradban

ASUS Zenfone 2

Zen & the art of good pricing

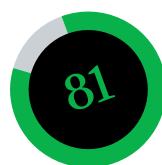
Interactive review

4 GB RAM eh? Wow, that's a lot of background app activity, something that is especially important for the resource hungry Android OS. More on that later.

The metallic finish on this phone gives it a premium feel. It's not seamless though. The brushed metallic finish should have continued over the top and bottom bezels, with on-screen buttons, instead of physical ones. The black glossy plastic on the front doesn't go with the back.

The UI needs to be simpler and less gimmicky. The Zenfone 2 has 28 pre-loaded apps, most of which you wouldn't need.

The simplest way to define this phone's performance would be something squarely between the Snapdragon 800



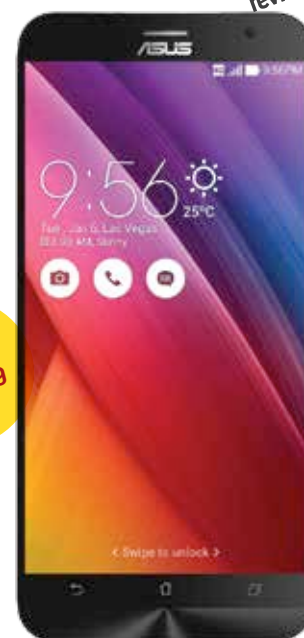
Features	87
Design	72
Performance	89
Value	90

Specifications

Display: 5.5 inch 1080p; **RAM:** 4GB; **OS:** Android 5.0 with ZenUI; **Processor:** 2.3GHz Intel Atom Z3580 quad-core; **Camera:** 13MP rear, 5MP front; **Battery:** 3,000 mAh

Contact

ASUS India Pvt Ltd
Phone: 1800 209 0365
Email: NA
Website: www.asus.com/in



Price
₹19,999

and Snapdragon 801 from Qualcomm. What's even more heartening is the PowerVR G6430 processor, same as what Apple used in the iPhone 5S. The performance is similar to the OnePlus One and Xiaomi Mi4.

The Intel processor isn't as battery efficient as its compatriots though. On regular usage, with some light gaming, but lots of emails and texts, the phone lasted for about 10 hours. OK, nothing great.

The major weakness though is in the camera. The Zenfone 2 is nowhere close to the best. The camera lacks details and struggles to focus when light conditions are uneven. In bright sunlight, images were severely over-saturated and they appeared blown out in indoor light.

Besides the camera, the Zenfone 2 would make for a very good buy.

Prasid Banerjee



Noctua NH-L9x65

This thing is small. Really small...

Features 88
Build Quality 90
Performance 60
Value for money 55

Specifications

CPU Support: Intel Socket LGA 2011-0/2011-3/1156/1155/1150 AMD Socket FM1/FM2/ FM2+/AM3+/AM3/AM2+/AM2; **Dimensions:** 65(H) x 95(D) x 95(W) mm; **Weight:** 413 grams; **Base:** Copper (Nickel plated); **Fan Speed:** 2500 RPM (+/-10%); **Warranty:** 6 years

Contact

Prime ABGB
Phone: +91-22-6740 2006
Email: sales@primeabgb.com
Website: www.primeabgb.com

We tested two low profile CPU coolers – the Noctua NH-D9L and Noctua NH-U9S just last month and were quite impressed with them. This time around, we have another much smaller (read 65mm) offering from Noctua that aims to provide the perfect fit on a Mini-ITX board. It doesn't obstruct RAM or PCIe slots on the board thus making it 100% compatible for a Mini-ITX based system. We also saw that the area around the socket after installing the cooler didn't get too cramped which you know is really helpful if you've ever worked on a Mini-ITX build. Apart from its small dimensions, the NH-L9x65 has a plain squarish look to it but it's apparent that Noctua were gunning for the



Price
₹3,800

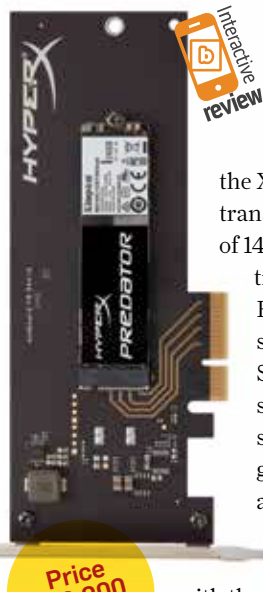
shortest heat-sink height possible which wouldn't hamper performance and they've hit the bull's eye with that. Speaking of performance, the NH-L9x65 managed to keep the 3770K at 35°C when idle and the load temperature never crossed 67°C. Although the load temperatures are on the higher side, they're alright for a cooler this size and it fares much better than the Intel stock cooler. The NH-L9x65 uses the Noctua NF-A9x14 fan that runs almost silent but is slightly audible at max fan speed. With an impeccable build quality, a long list of accessories that include the popular Noctua NT-H1 thermal paste among other useful things, the NH-L9x65 is a dependable low-profile cooler to go for.

Siddhant Sharma

Kingston HyperX Predator 480GB SSD

So long SATA, PCIe here we come

There aren't many M.2 SSDs marketed for desktop PCs. Samsung did come out with the XP941 last year and the benchmark figures were off the charts. The Kingston HyperX Predator is a similar device but with a few benchmarks ranking it higher than the competitor from Samsung. It uses a PCIe Gen 2.0 interface and requires four PCIe lanes. The adapter looks quite good with a matte black PCB solder mask that has now become staple in the motherboard industry so there's no way it's going to look out of place. The big HyperX branding on the top is also a nice touch. Moreover, in case you do feel like using an M.2 drive that isn't 80mm long in this adapter then it does have mounting holes for 42mm, 60mm and 110mm cards provided they are M-keyed. This particular SKU even came with a low height adapter. The



Price
₹48,000
(Estimated)



eight NAND chips used on the Predator are Toshiba A19 MLC NAND, each being of 64 GB.

Performance wise, the Predator registers ahead of the XP941 when it comes to IOPS and transfer rates. With read/write speeds of 1400MB/s and 1000MB/s respectively, it does seem really promising. However, 4K and 4KQD32 write speeds are lower than what most SATA SSDs come with. The Samsung 850 Pro produced a 4K write speed of 167.6MB/s and the Predator gave us 113.5MB/s. 4K read speeds are in tandem with SATA SSDs, so if you look at the big picture, you are indeed moving up with the Predator and it comes to you for an estimated price tag of ₹48,000.

Mithun Mobandas



Performance 90
Build 70
Value for Money 55

Specifications

SHPM2280P2H/480G
Form factor: M.2 2280 with PCIe; **Cost/GB:** '100; **Dimensions:** 80x22x3.5 mm; **Controller:** Marvell 88SS9293; Toshiba MLC NAND; **Warranty:** 3 years

Contact

Kingston Technology
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Website: <http://www.kingston.com/>



Self driving cars made public

Google is all set to launch the Self Driving Car to the public in California. Read more: <http://dgit.in/1QWQdZh>



Apple buys maps!

Apple Inc recently acquired a navigation company to improve mapping services. Read more: <http://dgit.in/1B6X5WI>

Yu Yuphoria

Good but not the best



The Yu Yureka is a good looking device, easily the best in the sub-7k segment right now. The addition of metal on the side can easily sway a buyer towards the Yuphoria. The rounded metal edges though add more than just looks to the device. The rounded edges fit right into your palm, making the phone feel very natural while you hold it. The looks are unique for the budget segment.

The first pitfall for the Yuphoria is in its display. There's a definite pinkish hue all over the display, which makes apps, images and videos look weird, if not bad.

On the other hand, its biggest selling point is CyanogenMod 12 and Android 5.0. This makes the phone only



Price
₹6,999

the second after the Moto E, to boast Android Lollipop out of the box in the sub-7k segment.

Benchmark lovers will have nothing to complain about here, the Yu Yuphoria performs just as good as the Lenovo A6000 Plus and Xiaomi Redmi 2. In general, you can play intensive games for about 25 minutes before the phone starts really heating up and the lags start creeping in.

The most disappointing aspect of the Yu Yuphoria was the camera. The camera overexposes images in bright sunlight and washes them out in indoor settings. It is also somewhat slow to focus, irrespective of the light conditions.

At ₹6,999 it's a very good smartphone to buy, as long as the camera isn't a priority for you. If you need a good camera, then the Xiaomi Redmi 2 is a better smartphone at the same price.

Prasid Banerjee



Design 76
Performance..... 74
Features 88
Value 66

Specifications

Display: 5 inch 720p IPS;
Processor: 1.2 GHz Qualcomm Snapdragon 410 quad-core 64-bit;
RAM: 2GB; **Operating System:** CyanogenMod 12; **Battery:** 2230 mAh; **Camera:** 8MP rear, 5MP front

Contact

Yu Play God
Phone: 1800 3000 9009
Email: NA
Website: www.yuplaygod.com

JBL Go

Ready, Set...

The JBL Go is a very portable wireless Bluetooth speaker aimed at the budget segment.

The JBL Go is a block-shaped Bluetooth speaker that resembles an oversized matchbox. It is very light at 130 grams and is small enough to fit into most handbags. I liked the way the Go looked and its design grabs attention in the best way possible.

Considering its size, I was surprised by the audio performance of the JBL Go but not to an extent where it would be able to compete against the larger, more expensive Bluetooth speakers. The JBL Go is reasonably loud and the audio output is without distortion



Price
₹1,999

till about 60-70% of the maximum volume level. Beyond that, there is audible crackling.

The Go is most comfortable with genres of music that depend on treble and highs. When it came to acoustic tracks or rock songs without too much instrumentation, the Go was very impressive. On the contrary, the Go disappoints when it comes to genres that rely on bass and quite frankly, if you've got a lot of EDM or other club music in your playlist, you won't get the best out of the Go.

The Go has very good battery life and even though the company claims that it's able to deliver about five hours of continuous playback, I was able to eke out 10 and a half hours.

The JBL Go is currently available for ₹1,999. It's a good buy if you're looking for a decent Bluetooth speaker that you can carry around anywhere without issues. However, if you want better audio quality and don't mind losing out a bit in the portability department, and also don't mind spending more, then look at the JBL Charge or the JBL Flip II.

Nikhil Pradhan



Performance..... 62
Build & Design..... 73
Features 72
Value for Money..... 81

Specifications

Bluetooth version: 4.1; **Support:** A2DP V1.2, AVRCP V1.4, HFP V1.6, HSP V1.2; **Driver:** 1 x 40mm; **Output power:** 3.0W; **Frequency response:** 180Hz - 20kHz; **Signal-to-noise ratio:** >80dB; **Battery type:** Lithium-ion polymer (3.7V, 600mAh); **Dimensions (H x W x D):** 68.3 x 82.7 x 30.8 (mm); **Weight:** 130g

Contact

Harman India
Phone: 1800 229 291
Email: <http://dgit.in/1F3BvD8>
Website: www.harman.in



Melting faster than before

NASA reports that ice shelf Larsen-B in Antarctica is rapidly melting. Read more: <http://dgit.in/1IGNUUI>



Boys have all the fun?

A gender-biased statement results in women scientists taking over Twitter. Read more: <http://dgit.in/1EWn4lf>

Bazaar



Gionee Elife S7

Not just a beauty

Feature 86
Performance..... 64
Value 58
Design..... 74

Specifications

Display: 5.2 inch display with 1920 x 1080p resolution (424ppi); **Battery:** 2750mAh; **Storage:** 16GB; **Camera:** 13MP rear with LED flash, 8MP front; **SoC:** Mediatek MT6752; **CPU:** 1.7GHz Octa-core; **RAM:** 2GB; **Operating system:** Android 5.0; **Connectivity:** 4G, W-Fi, Bluetooth, Dual-SIM

Contact

Gionee
Phone: 1800 208 1168
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Website: <http://www.gionee.co.in>

Gionee smartphones have been around in India for quite some time now and with each new flagship the company tries to make smartphones slimmer and the Elife S7 is another fine example. Gionee has done a very praiseworthy job in terms of design as the slim phone holds a lot of hardware inside. In addition, the 5.2-inch AMOLED display on the Gionee Elife S7 is just as good as the design.

The Gionee Elife S7 runs on Amigo UI 3 which is layered on top of Android 5.0 Lollipop. Even though many phones which offer a custom UI on top of Android Lollipop allow Google's Material Design to peek through, Gionee has completely removed any hints of Material Design. The Gionee Elife S7 is powered by the 64-bit MediaTek SoC



MT6752. This is a much better SoC than its previous generations and the Gionee handles daily tasks, multiple apps and Full HD video content with ease. Gaming performance is not bad either.

Battery life is also good and the smartphone gave me around 7-8 hours of on-time during a normal day with moderate usage, which is good enough. The 13MP camera at the back is an average one and lacks the finesse of a flagship shooter.

The Gionee Elife S7 falls considerably short of the standards set by most flagship smartphones and it relies a little too much on its looks. Overall, the S7 is a noteworthy option if your requirements don't include a good camera, stock Android UI and microSD card slot.

Hardik Singh

Amazon Kindle Voyage

Amazon's best e-reader till date

Amazon takes everything from the Kindle Paperwhite and makes it better with the Voyage. To start with, it's a better design. The Kindle Voyage retains the 6-inch display, but it's a thinner and lighter than the Paperwhite. The Kindle Voyage is only 7.6 mm thick and weighs 188 grams to the Paperwhite's 9.1 mm and 215 grams.

The Voyage has four buttons for page turns, while everything else is touch-based. The page turn buttons need to be pressed too hard to get results. You will almost never use them.

The Voyage bumps up the screen sharpness to 300 ppi, making the Paperwhite's 212 ppi seem really bad. This, on an edge-to-

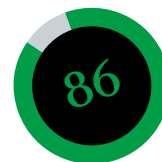


Price ₹16,499

edge plastic E-Ink Carta display feels exactly like reading a book. What's even better is that the Voyage is more responsive than any other Kindle. You'll never notice the backlight adapting to your surroundings, and the keyboard is more responsive than any other Kindle. Even with the 'refresh every page' option turned on, the Kindle Voyage barely ever feels slow.

The only hurdle with the Voyage is the price, it costs ₹16,499 and ₹20,499 for the Wi-Fi and 3G versions. So, if you have the budget, then this is indeed the best e-book reader that you can buy. If not, the Kindle Paperwhite is definitely worth the compromise.

Prasid Banerjee



Design 90
Readability 90
Battery Life 90
Value 70

Specifications

Display: 6-inch E-Ink Carta, 300ppi; **Dimensions:** 162 mm x 115 mm x 7.6 mm; **Connectivity:** Wi-Fi, 3G; **Cloud Storage:** Free cloud storage for all Amazon content; **Battery Life:** One month

Contact

Amazon India
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Email: info@amazon.com
Website: www.amazon.in



The internet is getting full!

Researchers find out that optic fiber cables are being physically strained, which might cause problems in loading. Read more: <http://dgit.in/1PtjedJ>



Chromeboxes hit India!

Google launches the Chromebox, a desktop variant of the Chromebook, in India. Read more: <http://dgit.in/90K-Asus-Chromebox>

Xiaomi Mi 4i

Good value, not for power users

The Xiaomi Mi 4i is the company's second phone in the ₹10,000 – ₹15,000 price bracket. The first being the immensely popular Xiaomi Mi3, with which the Xiaomi made its debut in India. The Xiaomi Mi 4i betters the Mi3 in almost all aspects except one, and that might just be its Achilles heel, especially if you expect the Xiaomi Mi 4i to be as fast and fluid as the Xiaomi Mi3 (more on this later). Also, the onboard 16GB storage with no MicroSD card slot might just be a deal breaker for many.

Design and Build Quality: With the Mi 4i, Xiaomi has achieved and almost perfected the art of creating a 5-inch smartphone which is compact, slim, lightweight and yet, manages to pack a large battery. At 130 grams, the phone feels super-light and offers a snug fit, thanks to the slim 7.8mm profile and matte finish plastic back, the Mi 4i feels secure and well made. If I was to pick one area where the Xiaomi Mi 4i sort of drops the ball in terms of design and finishing, it would have to be the power and volume rocker buttons. The chrome finish feels cheap and I would have personally preferred it if they had carried the same smooth premium color (and finish) as the body. Another thing I can nitpick about with respect to the buttons would be the sharp top edges which are really sharp and completely at odds with the otherwise smooth and well finished body.

Display: Xiaomi Mi 4i offers an extremely bright, vivid and sharp display that manages good color depth and excellent contrast. Being a fully laminated one piece/glass display, the visual impact is further enhanced, ensuring maximum impact of the vivid IPS panel along with excellent performance in terms of contrast and viewing angles. Having said that, I found the default factory calibration to be a touch on the cooler side. But that wasn't an issue once I changed the display tone to 'warm' under display settings. The 'Sunlight Display' does largely behave as advertised, and adapts to changes in ambient light conditions; improving on the contrast when the phone is used under harsh lighting conditions. During the entire review



Price
₹12,999

period I never had to worry about the display glare/readability under direct sunlight.

Performance: The Snapdragon 615 + 2GB RAM

combo will deliver smooth and lag free experience as long as you don't burden the device with heavy multitasking/gaming or use it in high temperature environments (Delhi summers). Under both conditions, the phone does tend to heat-up quite rapidly, causing lags and stutter when switching between apps as well as during gaming. In terms of synthetic benchmarks, the phone mostly performed at par with other phones with the same combination of Snapdragon 615 SoC and 2GB RAM. The so called second generation of Snapdragon 615 SoC used in the Xiaomi Mi 4i bumps the slower quad-

core cluster by 100MHz, resulting in 4 x Cortex A53 cores running at 1.1 GHz instead of 1.0 GHz. The real world performance boosts/benefits of the slight bump in core clocks aren't substantial. Overall, the Xiaomi Mi 4i performs well for its price-tag but it will surely not please the power user or anyone hoping for an absolutely lag free experience irrespective of the kind of apps and games one runs on it. Xiaomi Mi3 users should not look at the Xiaomi Mi 4i as an upgrade option.

The Camera: Xiaomi Mi 4i produces good quality images with minimal shutter lag. Overall, the Mi 4i camera is almost at par and sometimes even better than the Xiaomi Mi4 in normal to average light conditions, though, in low-light, the performance does take a slight dip with some more noise creeping in. However, in its price range the Xiaomi Mi 4i is miles ahead of the competition and the camera is better than the one found on the Asus Zenfone 2.

Battery life: Xiaomi Mi 4i manages to achieve an excellent balance between form-factor, weight and battery capacity. The large 3120mAh battery pack inside the Mi 4i ensures enough juice for almost 2 full days for light to moderate users (without gaming) and will surely last through the day for heavy users.



Rating77
Features73
Performance.....72
Value75

Specifications

Network support: 4G; **SIM:** Dual 4G SIM support with dual standby; **OS:** Android OS, v5.0.2 (Lollipop); **SoC:** Snapdragon 615, 64-bit Octacore with Adreno 405 GPU; **RAM:** 2GB; **Storage:** 16GB, no Micro SD slot; **Screen:** 5-inch IPS, 1080p; **Camera:** 13MP rear with dual tone, dual LED flash, 5MP front camera; **Video Recording:** 1080@30fps; **FM Radio:** Yes; **USB OTG support:** Yes; **Battery:** 3120 mAh; **Warranty:** 1 year

Contact

Mi India
Phone: 1800 103 6286
Email: NA
Website: <http://www.mi.com/in/>

Sobam Raninga

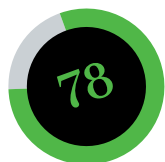


More Lumia to you!
The Microsoft Lumia 540 has been launched in India. Read more: <http://dgit.in/1FjntjW>



Going even more autonomous
The U.S Navy is planning to load LSRAM missiles on jets by 2019. Read more: <http://dgit.in/1KfvZot>

Bazaar



Philips 8500 Ambilight 4K TV

Puts on quite a spectacle!

Features 82
Performance..... 83
Design 75
Value 70

Specifications

Screen: 58-inch LED, 3840x2160 resolution;
Smart TV: Yes; Smart remote: Yes; **Weight:** 24 kg; **Connectivity:** 4 x HDMI ports, 1 x YPbPr or CVBS, 2 x USB Ports, Antenna IEC75, Common Interface Plus (CI+), Ethernet-LAN RJ-45, Digital audio out (optical), Audio L/R in, Headphone;
3D: Yes; **3D Glasses:** 2

Contact

Philips India
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Website: buy.philips.co.in

In this Philips TV, a row of LED lights running along the edge of its back panel, ambilight splashes colours from the screen on to the wall behind it, creating a unique spectacle while watching TV. It's a marketing gimmick that actually works quite well.

We spent a good month 'reviewing' this television, the 58-inch panel – tried it with Videocon UHD D2H, PlayStation 4, watched Blu-ray movies, high bitrate 1080p MP4 and MKV files, through a range of connected devices. The TV was up to task handling everything we threw at it, and watching movies and playing games on the set was quite an immersive experience, heightened by the whole



Price
₹2,35,000

ambilight effect. It's 400Hz refresh rate to negate stutter actually makes moving images move faster.

The overall brightness of the TV is at 302 cd/m², is quite great, we have no issues with the TV's sharpness and colour reproduction capabilities. The TV comes with a lot of wireless screen-sharing features, including Miracast, and its on-screen menu is a bit difficult to navigate at first. We especially like the smart remote Philips bundles with this set, as it has a dedicated QWERTY keyboard on its flipside, coming in handy while typing something in the TV's browser. 3D works well, and if you can afford it, this is a fine UHD television to buy right now.

Jayesh Shinde

ECS LIVA X Mini-PC

Small, Cool and Economical

Take a Mini-PC and shrink it down further and you'll get a LIVA X. This isn't the first time we've got our hands on Mini-PCs with low TDP but it sure is the first to come in a size that's so small, it feels deceptive. The LIVA X has an Intel Bay Trail-M SoC which has a TDP of 4.5 W which is similar to the credit card sized computers that are all the rage these days. The device is really well built from the placement of components inside to a really massive heatsink which not only does the job of a heatsink but also adds bulk to the product enabling it to stay in one place and not tumble at the slightest tug on one of its wires. The device did not heat up to the extent that laptops do even during the peak portions of PCMark so the passive heatsink works well.

Wi-Fi and Bluetooth are powered by an Azure-wave AW-NB087H which is a 1T1R 802.11n chip. 1T1R radios are sufficient for a client if you're not going to be streaming video content above FullHD. Unlike the Mini-PCs that we generally get to see, the RAM and Storage on the LIVA X are actually BGA chips so upgrading them isn't an option though if you ever need more storage then there is an mSATA expansion slot provided. Getting to the expansion slot requires you to pull the heatsink and it does take a little effort since the thermal pads are quite sticky. It doesn't sacrifice on aesthetics and given the usage scenario, the LIVA X is more than capable of getting the job done, i.e. we mean internet surfing and working on spreadsheets.

Mithun Mobandas



Price
₹14,900
(w/ Windows 8.1)



Performance..... 75
Features 70
Build 80

Specifications

Intel Bay Trail: M Celeron N2808; **Memory:** 2GB DDR3L; **Expansion Slot:** mSATA; **Storage:** eMMC 32GB; **Audio:** Realtek ALC283; **LAN:** RTL8111G Gigabit Ethernet; **Ports:** 1x USB 3.0, 2x USB 2.0; **Dimensions (LxWxD):** 135 mm x 83 x 40 mm; **Warranty:** 3 years

Contact

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Website: www.ecs.com.tw



Hackers steal from Starbucks

Hackers have managed to steal from the Starbucks app from customers with linked credit cards. Read more: <http://dgit.in/1bZiFKM>



A Volkswagen R2-D2!

A hardcore Star Wars fan painted his Volkswagen van to resemble the famous R2D2 bot. Read more: <http://dgit.in/1FjoUz2>

Lenovo A6000 Plus

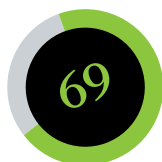
Not a complete upgrade

The Lenovo A6000 was notable for bringing 64-bit computing to the budget segment. However, since February other smartphone manufacturers have upped the game and have released phones that equal the A6000. Enter the Lenovo A6000 Plus. This has the same SoC, same design, same display but the RAM has been bumped to 2GB and the internal storage is now 16GB instead of 8GB. This has given the A6000 plus a slight edge over the A6000 in overall performance. However, in app experience is pretty much the same compared to the A6000.

The A6000 Plus has almost the same appearance



Price
₹7,499



Feature	85
Performance.....	70
Value	50
Design	74

Specifications

Display: 5 inch display with 1280 x 720p resolution (294ppi); **Battery:** 2300mAh; **Storage:** 16GB; **Camera:** 8MP rear with LED flash, 2MP front; **SoC:** Qualcomm Snapdragon 410; **CPU:** 1.2GHz Quad-core; **RAM:** 2GB; **Operating system:** Android 4.4.4; **Connectivity:** 4G, W-Fi, Bluetooth, Dual-SIM

Contact

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Email: smartphones@lenovo.com
Website: www.lenovo.com/in/en

and build quality as the older A6000 which means it boasts of solid build quality. The IPS LCD is works well and offers natural colour reproduction. It carries over the same battery pack as the Lenovo A6000 which is a 2300mAh Li-Po one but with the featured spec bump it is slightly less frugal.

Moving on to the camera and one can find the similarities to the Lenovo A6000 again. This means it is a good camera but it still can't outdo the 8MP camera on the Redmi 2. As for the UI, it uses Vibe UI 2.0 which is the same as the one used on the Lenovo A6000.

Overall, the A6000 Plus is a small upgrade over the A6000 and puts up a good fight against the competition. It could've been much better.

Hardik Singh

Xiaomi Mi Band

The Band of One

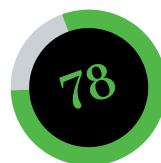
A fitness band at ₹999 does sound like a delicious deal, but the Xiaomi Mi Band comes with its share of compromise. At first glance, the device looks like a steal. The Mi Band has premium looks. In fact, the Yu Fit, even with its display, can't beat the Mi Band in the looks department.

The band is made up of two elements, the rubber strap and the dongle. The dongle is what houses the accelerometer and Bluetooth chip. The device is also IP67 rated, which means you can take a shower or go for a swim wearing the Mi Band.

The problem is, the Mi Band isn't very useful. The Mi Fit app, which is the heart of this wearable, seems very much like a work in progress right now. It crashes when you try to share your progress and doesn't offer many useful features. You can use it to set an alarm and ask the band



Price
₹999



Design	82
Features	51
Value	90
Battery.....	98

Specifications

Dimension: 14mm x 9mm x 36mm; **Weight:** 15 g; **Surface:** Aluminium sensor, polycarbonate band; **Connectivity:** Bluetooth 4.0 **Battery:** 41 mAh

Contact

MI India
Phone: 1800 103 6286
Email: NA
Website: <http://www.mi.com/in>

to wake you up half an hour before your alarm rings.

Apart from that, there's not much else you can do. The band will track your steps all day and give you a number on calories lost. You can't do much with this data, since it doesn't allow you to input the calories intake. In addition, the Mi Band can't track exercise beyond sit-ups and jump ropes. The Mi Band also redeems itself in the battery department. While the Mi Fit app conveniently shows that I've charged the band 55 days ago, while I've been using it for merely two weeks (yes I charged it completely before using it), the battery does last.

Overall, the Mi Band is a stepping stone to buy more useful activity trackers. At ₹999, this is the perfect entry level smartband for trying out a wearable device. It isn't enough for a fitness freak or serious health trackers. What it may do is push you to buy other wearable devices, which cost about five times as much as the Mi Band.

Prasid Banerjee



Design for NASA!

NASA announced a competition that lets people design a 3D habitat for extraterrestrial planets. Read more: <http://dgit.in/1Fta6Rm>



Hacking into an airplane?

An FBI researcher claims to have controlled a plane's engines from his laptop. Read more: <http://dgit.in/1bZGVHO>

Bazaar

Dell Latitude E7250

Tiny, well built, but doesn't blaze a trail

Sandwiched between the Vostro, at the lower end, and Precision, at the higher end, is Dell's Latitude series of laptops, built for businesses who desire an uncompromising notebook that gets the job done. To that end, the Latitude E7250 is a pretty good high-end business laptop, with quite a few hits and misses.

If you had any apprehensions of this laptop being a looker, drive them out of the window, because it's every bit a dull and boring business notebook – very similar to the Lenovo ThinkPad X1 Carbon we've reviewed this month. It has a carbon fibre screen lid, and a magnesium alloy chassis to make the Latitude E7250 rugged and super slim at the same time. For its 12.5-inch form factor, the notebook weighs only 1.25 kg – only the Toshiba Portege Z30T-A weighs lower at 1.18 kg among business laptops we've tested in the recent past. Solid screen hinges do a great job of securing the notebook when its closed, and this makes the Dell Latitude E7250 incredibly easy to carry around – its lightweight ensures it can be tucked away in even the smallest of backpacks.

Apart from its tiny form factor, we like the Latitude E7250's matte screen surface – a rarity on notebooks these days – which, in our opinion, is ideal for business notebooks that don't emphasize on multimedia and keep away glares. However, its performance isn't quite the best, as its brightness reads at 184.3 cd/m² in our Spyder tests, and its contrast ratio is just disappointingly low. Its onboard audio is at par with the ThinkPad X1 Carbon's at mid volume, and alright for personal entertainment or video conferencing in a boardroom. The HD webcam is nice for video conferencing on Skype or Google Hangout, and its microphone is a little oversensitive to any sound in its vicinity.

The notebook doesn't spring any surprises as far as its core performance goes. It sports an Intel Broadwell Core i5 chip which isn't as high performing as the ThinkPad X1 Carbon's Core i7, but paired with oodles of RAM and a 128GB SSD, it manages to do a good overall job in executing day-to-day tasks. However, due to its low weight, it only packs in a 3-cell battery, which lasted only 2 hours 46 mins in our high performance battery test – lower than the Portege Z30T-A which weighed in similarly. At a conservative battery plan, one



Price
₹1,13,935

can hope to extract just a little over 4 hours of battery backup on a single charge. Of course with a docking port, a battery extension can be slotted in (if required, at extra cost). So yeah, the Latitude E7250's performance is good, but not great.

The Latitude E7250's keyboard is different from the ThinkPad X1 Carbon's in terms of layout and key size, but it performs equally well, which was a big surprise. The small backlit chiclet-sized keys are easy to get used to and great to type on, and its large touchpad with dedicated mouse buttons are a joy to interact with. As a combination, the Latitude E7250's compact keyboard and touchpad work extremely well, better than quite a few larger form factor machines we've reviewed in the recent past in fact.

Of course, another important thing to note about the Dell Latitude E7250 is it comes with the 5th generation of Intel vPro security and management features, including (and not limited to) enhanced wireless connectivity (displays), hardware SSD encryption, active and remote management capabilities, and then some. All of this is music to any self-respecting business establishment's ears that wants to deploy the Latitude E7250s in its workforce.

The Dell Latitude E7250 may not be as glamorous as the ThinkPad X1 Carbon or Toshiba Portege Z30T-A, but it is a solid, dependable machine all the same, with some unique offerings for businesses that may be interested in them.

Jayesh Shinde



Features	74
Performance	70
Design	78
Value	77

Specifications

Screen: 12.5-inch matte LED, 1366x768 res; **CPU:** 2.3 GHz Intel Core i5-5300U; **RAM:** 4GB; **SSD:** 128GB; **GPU:** Intel HD 5500; **Weight:** 1.25 kg; **Battery:** 3-cell; **Wireless:** Wi-Fi 802.11ac, Bluetooth 4.0; **Connectivity:** 3 x USB 3.0, HDMI, mini DisplayPort, Gigabit Ethernet, SD Card slot, docking port; **Webcam:** 720p; **Warranty:** NA

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SMARTPHONE SHOPPING ON A BUDGET

Who says buying a decent smartphone requires you to break the bank? We compare smartphones between ₹7k to ₹15k, from brands like ASUS, Blackberry, Karbonn, Motorola, Xiaomi and Yu to tell you which one deserves to be your next purchase.

Prasid Banerjee
prasid.banerjee@digit.in

Since Digit first came into being, we've seen a lot of changes through the technology fabric. From laptops coming into fashion, smartphones grabbing everyone's imagination, ushering in tablets and the country becoming one of the top markets in the world. None of that though has been more significant than what all of us have witnessed over the last year or two. While most focus on the budget revolution in India, an

important aspect that has just started creeping in is a change in the market itself.

The Indian consumer today is much more educated and informed than he or she once used to be. There was a time we would buy a Nokia 7610 (yeah, that phone you don't even remember) simply because it costed a lot and looked good. The regular consumer would buy phones based on the price, without actually trying to find out whether the investment



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Garbage Cat is a 2D game that lets you be a cat that loves irritating its owner.
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Good times return?

Popular gaming company Nintendo reported the first profit since 2011. Read more: <http://dgit.in/1S1lnMc>

Budget smartphones

HOW WE TESTED

Before we get to that, let us clear that question nagging you right now. Is this a fair comparison? Well, we argued about this amongst the team here and decided that it is. Of course there is a gap between the sub-7k smartphones and those costing around 15k, but that doesn't mean any of them are bad. In fact, in today's market, an inexpensive smartphone has a better shot at giving more value for money than a more expensive one does.

The tests we did gave us our picks, and we went ahead and chose one of our own as well. The aim of this comparison is not just to establish the best smartphone in these price segments, but also to provide perspective. It will tell you how close or behind the phone you were choosing is and whether you may still go for it.

Onto the task at hand then, we used nine smartphones for this comparison — the Xiaomi Redmi 2, Lenovo A6000 Plus, Moto E 4G, Yu Yuphoria, Karbonn Titanium Mach One, Karbonn Titanium Mach Two, Xiaomi Mi4i, Asus Zenfone 2 (2GB RAM, 1080p display) and BlackBerry Z3.

There are some big names here, formidable competitors and phones that we've received a lot of queries about.

How exactly did we test these little gadgets though? By now you would know that we have our processes set for this purpose. We started out with synthetic benchmarks, gaining a completely objective view on each of these smartphones performance potential. We tested both the CPU and GPU to figure out which one of these could do the best and which ones were lagging behind.

Next we moved on to test the camera performance of the devices. The camera is an important aspect of smartphones today, with each having its own merits and demerits, while some are just plain better than others. We took the phone into different light conditions, including, bright sunlight, low light, fluorescent light and the dreaded low light conditions. We took the same images with each of these devices and compared them side by side on a calibrated display to find out what was what.

The next important task to accomplish was to test out the battery life on these smartphones. We used a combination of our own in-house test, which we have been using for years, combined with the Geekbench 3 Battery Test to determine how long the battery on these phones can last.

We also compared the display on these devices using a combination of basic tests that have been explained in the how to section in this issue, along with benchmarks and other screen tests. The emphasis was on viewing angles and accurate colour reproduction, while we also considered the overall brightness of the screen.

A careful examination was also made of the overall build quality of these smartphones, taking into account the quality of material used and finishing on the products.

With all that taken into account, we fed in the numbers to our tried and tested algorithms and came out with our winners. Here's how it panned out.



Karbonn Titanium MACH ONE

he or she's making is actually worth the money. That's not to say the 7610 was a bad phone, it had its merits, but many or most of us never really took the time to find that out in the rush to go buy it off the shelf.

Behold, the new generation, where a company can not just come in with a smartphone that looks good, expecting to sell it. Nor is it as easy to sell jargon in India as it used to be. The consumer today is seriously more educated, knowing what compromises they want to make and which ones they need to make for a phone to fit their exacting budget.

This, accompanied by the fact that the budget and affordable smartphone segments offer real quality nowadays has made these segments much more important than the flagships out there. Yes, a Samsung Galaxy S6 and LG G4 still make the news,

but they aren't quite as important as they used to be, simply because a lot of the advanced features sported by past flag-



ships have percolated down to low-end or budget smartphones, and this has bridged the gap between high-end phones and low-end smartphones.

That brings us to the topic of this story. It seems this is



End of an era?

Dodge offers a throwback - unveils the Viper ACR
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Google could be our Skynet

Elon Musk feels that Google could one day build robots that might be the downfall of humanity.
<http://dgit.in/1EesWVm>



Karbonn Titanium MACH TWO

the perfect time for us to do this comparison. The budget and affordable smartphone segments have had their fill of devices in the last few months and you have a wide range to choose from now, ensuring you get the best bang for your buck. So, off we went, contacting the companies and getting some of the best budget and affordable smartphones out there.

This is a battle between the big guns from the sub-7k and sub-15k smartphone segments.

BUILD AND DESIGN

There's a lot of merit to the build and design department of a smartphone. The looks of a smartphone and how well it is built are the first things that attract a customer, so it better

be good. For an OEM, it is very important to get things right.

Four phones stood out in this department - the Yu Yuphoria, Xiaomi Mi4i, Asus Zenfone 2 and the BlackBerry Z3. In terms of pure looks, we lean towards the Mi4i, although the Yuphoria is a very good looking smartphone for its price range. The Asus Zenfone 2 does well with the brushed metal finish on its back, but the looks aren't quite good enough to outdo the Xiaomi Mi4i.

Even in terms of the overall seamlessness of the design and build quality, Xiaomi outperforms the others. The Yuphoria has a metal frame, which is good for a budget device, but it isn't as sturdy as the Mi4i or the Zenfone 2.

Speaking of sturdiness, that's one area where the BlackBerry Z3 outdoes all the other smartphones.

The two Karbonn phones are also pretty well built. In fact, the Titanium Mach One and Mach Two are quite literally design knock-offs of the Apple iPhone 6 and iPhone 5S respectively. Of course, they aren't built using premium materials and feel rather flimsy and opposite of Apple's iPhones.

DISPLAY

If you're buying a sub-7k smartphone and the display is your priority, then you can't go wrong with the Xiaomi Redmi 2. The Yu Yuphoria and Lenovo A6000 Plus have good displays, but they can't hold a candle against Xiaomi. The Moto E 4G on the other hand loses out to all its competitors. It is just not sharp enough to matter in the display department.

The best display out of the eight smartphones taken into consideration though has to be given to the Xiaomi Mi4i. The wide viewing angles combined with really accurate colour reproduction won us over. If that wasn't enough, the Mi4i's 1080p display also feels really nice and premium and doesn't get smudged with fingerprints at all.

The Asus Zenfone 2 also has a pretty nice 1080p 5.5 inch display, but it is neither as bright as the Mi4i, nor as sharp.

PERFORMANCE

This one came out exactly as we expected it to be. The Asus Zenfone 2 was the runaway winner in the performance department. The Intel Atom Z3560 quad-core processor clocked at 1.8GHz performs well above what the Xiaomi

Mi4i can achieve. The Zenfone 2 doesn't just handle multi-tasking and resource intensive applications easily, but offers very good GPU performance. In case you're wondering, the phone has a PowerVR G6430



GPU, which is what the Apple iPhone 5S also uses.

The Zenfone 2's performance may not be the same as the iPhone, but it's enough to edge out all the other devices in this comparison. On benchmarks, the Zenfone 2 clocks above 40,000 on AnTuTu, while GFXBench's Manhattan Onscreen test clocks around



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BAE Systems adopts rejected F1 suspension tech and installs it in tanks.
 Read more: <http://dgit.in/1PtNULS>



	Karbnonn Titanium Mach One	Karbnonn Titanium Mach Two	Moto E 4G	Xiaomi Redmi 2	
Price	₹6,999	₹8,599	₹7,999	₹6,999	
Processor	1.3 GHz quad-core	1.3 GHz MediaTek MT6592 octa-core	1.2 GHz Qualcomm Snapdragon 410 quad-core 64-bit	1.2 GHz Qualcomm Snapdragon 410 quad-core 64-bit	
RAM	1GB	1GB	1GB	1GB	
Storage	8GB, expandable to 32GB	8GB, expandable to 32GB	16GB, expandable to 32GB	16GB, expandable to 32GB	
OS	Android 4.4	Android 4.4	Android 5.0	Android 4.4	
Camera	8MP rear, 5MP front	8MP rear, 8MP front	5MP rear, VGA front	8MP rear, 2MP front	
Battery	1800mAh	1900 mAh	2390mAh	2200mAh	
Display	4.7 inch HD	5 inch HD	4.5 inch qHD	4.7 inch HD	
Performance Scores	47.29	67.91	66.25	71.72	
Features	68	68	63	73	
Design	56.58	56.58	71.61	76.45	
Overall	75	78	84	87	

750, nearly double of what the Xiaomi Mi4i can offer.

Another great performer was the Yu Yuphoria, which

showed good results for its price tag. The Yuphoria clocks around 23,000 on AnTuTu, while excelling in other areas as well. The Yuphoria is followed closely by the Xiaomi Redmi 2 and Lenovo A6000 Plus. The extra 1GB RAM on the Yuphoria and Redmi 2 allow them to edge past the Redmi 2 in this test, but the Xiaomi device still proves itself to be a formidable competitor. In addition, the 4G variant of the Moto E finally comes closer to its competitors in terms of the performance. The lower resolution display on the Moto E allows it to clock higher GPU scores, while the CPU performance is pretty much the same. Of course, all this comes at a higher price tag and the camera is still very weak.

CAMERA

The competition was much closer in the camera department. In the end, it was the Xiaomi Mi4i that came out as the winner, but what we were

very impressed by was how close some of the sub-7k devices came to the winner, particularly the Xiaomi Redmi 2.

It goes to show Xiaomi's prowess in the camera department. While the Redmi 2 isn't at the same level as the Mi4i, it's still a very good camera and one that anyone buying a sub-7k smartphone would be happy with.

The Mi4i on the other hand combines accuracy and speed to come out on top of all others. The shutter response time is minimal and it produces very good images in all light conditions. It is a little weak in low light conditions, but still much better than any other smartphone in this price bracket. Moreover, the Mi4i has an amazing HDR mode, which produces bright and vibrant images, even in low light.

It is also important to note that the Asus Zenfone 2, which also has a 13MP camera like the Mi4i, doesn't hold a candle against this device. The Zenfone 2's camera is passable at best and not as great as the Mi4i.



Lenovo A6000 Plus



BlackBerry Z3



Say bow!

Nikon has developed a camera mount for dogs that tracks the dog's heart rate and snaps a picture accordingly. More here: <http://dgit.in/1Aaxlh4>



Crazy Car

Have to 30k to spare? This car is up for sale. <http://dgit.in/1HpXXx4>

Budget smartphones



	Yu Yuphoria	Lenovo A6000 Plus	Xiaomi Mi4i	Asus Zenfone 2	BlackBerry Z3
	₹6,999	₹7,499	₹12,999	₹14,999	₹12,490
	1.2 GHz Qualcomm Snapdragon 410 quad-core 64-bit	1.2 GHz Qualcomm Snapdragon 410 quad-core 64-bit	1.7 GHz Qualcomm Snapdragon 615 octa-core 64-bit	1.8GHz Intel Atom Z3560 quad-core	1.2GHz Qualcomm Snapdragon 400 dual-core
	2GB	2GB	2GB	2GB	1.5GB
	16GB, expandable to 32GB	16GB, expandable to 32GB	16GB, non-expandable	32GB, expandable to 64GB	8GB. Expandable to 32GB
	Android 4.4	Android 5.0	Android 5.0	Android 5.0	BB OS 10.3.1
	8MP rear, 5MP front	8MP rear, 5MP front	13MP rear, 5MP front	13MP rear, 5MP front	5MP rear, 1.1MP front
	2230mAh	2300mAh	3120 mAh	3000 mAh	2500 mAh
	5 inch HD	5 inch HD	5 inch Full HD	5.5 inch Full HD	5 inch qHD
	75.17	69.14	100.81	108.21	66.45
	79	78	71	96	47
	68.71	69.03	70.32	75.29	70.97
	89	81	84	89	64

It can take some good images under optimal light conditions (sunlight), but fails in almost all other conditions.

As mentioned above, the Moto E's camera is dismal, but it's not alone. The Yu Yuphoria is also weak in this department, along with both

BATTERY

You would have noticed that we've not talked much about the BlackBerry Z3 till now. That's because the device doesn't quite match up to the other devices in the performance or camera departments. Battery life is a different story though. On our tests, most of the other smartphones can go on for seven hours at best, while the BlackBerry Z3 can hold its own for over 12 hours.

You would think this is the best possible battery life amongst these devices right? Well, think again. The BlackBerry Z3 was outperformed by the Asus Zenfone 2, which took the test for a solid 16 hours. Yes, even we were surprised to find an Intel processor perform so well on this test.

The Xiaomi Mi4i also showed prowess in the battery department, although it couldn't outperform the Zenfone 2 or BlackBerry Z3. The device lasted about 8 hours on the test. In



the Karbonn smartphones. The Yuhphoria tends to overexpose images under sunlight, while indoors, we often got washed out pictures.



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**ASUS Zenfone 2**

regular usage, it lasts for about a full day easily. Credit must be given to Xiaomi here, for fitting in a large 3120 mAh battery pack in a device as compact as the Mi4i. The device is actually slightly smaller than the Yu Yuphoria and much smaller than the Zenfone 2, but has a bigger battery pack than both of those smartphones.

The worst amongst these smartphone was the Karbonn Titanium Mach One, which lasted for a mere hour and a half on the battery test. To put

it simply, you can't watch an entire full HD movie on this smartphone without having to charge the battery in between.

BEST PERFORMER: ASUS ZENFONE 2

After comparing the nine smartphones, it is evident that the Asus Zenfone 2 is way ahead of the others in terms of pure performance, and it's no surprise why – the thing comes with not one, but two gigs of RAM. In fact, in the sub-15k smartphone category, it would be safe to say that the Zenfone 2 is well ahead of any other smartphone, and props to ASUS and their secret sauce that ensures the phone beats every other competitor convincingly by a big margin. The phone clocks high on benchmarks and can translate the scores into real life performance as well.

Asus' partnership with Intel, which began the Zenfone line last year has been quite successful, but never more so than the Zenfone 2. The company's earlier Zenfone 5, Zenfone 6 etc.

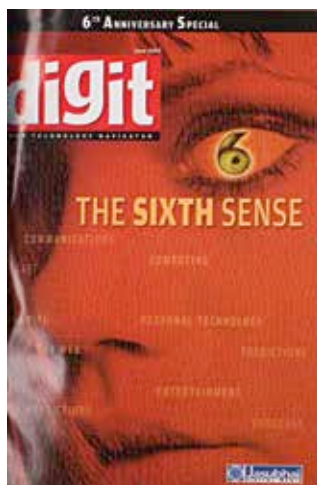
were good devices, but not quite as powerful as this one. The Zenfone 2 performs almost as well as the OnePlus One, which costs almost 40 percent more

than this device. At ₹14,999, if you're looking for a smartphone that will be able to take whatever you throw at it, then this is the one to go for, hands down. We are pretty certain that you won't be disappointed by your choice. Oh no sir!

BEST BUY: YU YUPHORIA

Speaking from a value for money point of view, the Zenfone 2 is a very good phone to buy, but the Yu Yuphoria's lower price tag is hard to deny. The phone performs very well for one that costs merely ₹6,999 and will provide great bang for your buck, unmatched by any other of its competitors in the market.

In terms of benchmarks, the Yu Yuphoria is competitive, with good results on both CPU and GPU tests – we were pleasantly surprised by its performance given its especially conserva-



Yu Yuphoria



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Doom 4 on its way?

After much delay, the latest version of Doom 4 is all set to hit the stores. Read more: <http://dgit.in/1ecHBLI>

Budget smartphones



Xiaomi Redmi 2

tive price. In addition, what makes the deal even sweeter is the fact that it runs on Android Lollipop, the only sub-7k smartphone except the Moto E to offer the newest, most latest version of the OS out of the box – a commendable achievement, one that is extremely important while buying the phone at the price. Of course, most will be more excited with the fact that Android Lollipop is only at the core, while the phone really runs on the CyanogenMod 12 system. This makes it a geeky phone to buy for all budget-conscious geeks out there.

If that weren't enough, the Yuphoria looks very unique for a phone that costs merely ₹6,999. It's the only sub-7k smartphone to have metal on it right now, even if it is just on the sides. In fact, what we liked even more is the matte finish plastic on the back along with a big

spherical camera module. The device looks a lot like the erstwhile Nokia Lumia 925 and feels really premium for its price tag. So far so great, right? And you must be wondering why this phone loses out if we're waxing all eloquence about it.

While the looks and build of the Yu Yuphoria are its greatest strengths, the phone is somewhat weak in the camera department. That is not to say that the camera is bad. The 8MP shooter on the back is passable, but not as good as the Xiaomi Redmi 2, which, as we mentioned before, has an amazing camera.

EDITOR'S PICK: XIAOMI REDMI 2

With the objective part of this test out of the way, let's take a look at what the consumer looks for while buying a smartphone. We of course want a device that is inexpensive, while still

allowing us to do anything that we would want to. In addition, we want a good camera, one that can take good images irrespective of the light conditions. We are the consumers, our demands are high, and the phone we buy have to come as close as possible to meeting those demands.

Credit must be given to the Xiaomi Redmi 2 here, which in our opinion is still the best sub-7k smartphone in the market, all things considered. The Yu Yuphoria may have its merits, but the performance difference between the two is very small and they both cost the same. What the Redmi 2 loses in the performance department, it more than makes up for with its best-in-class camera at the price. So most definitely, this is the phone for all you clickers.



In addition, the Redmi 2 looks very nice. Yes, it doesn't have any metal on it, but in the budget segment, we can't really penalise the device for it. If you're looking for the perfectly balanced budget smartphones, then the Xiaomi Redmi 2 makes for a very good option. **d**



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